



FRIDAY, JULY 23.

## Train Accidents in June.

The following accidents are included in our record for the month of June:

## REAR COLLISIONS.

Very early on the morning of the 2d, a freight train on the Toledo, Peoria & Warsaw road ran into some cars left by a preceding freight at the foot of a grade at Spoon River bridge, near Smithfield, Ill., the engine being unable to take the whole train up the grade. The engine was damaged, several cars wrecked, and three men in the caboose hurt. The conductor of the first train went back to signal the other, but mysteriously disappeared. It was thought by some that he fell into the river, by others that he failed to signal the train and ran away when he saw the accident.

Early on the morning of the 2d, a passenger train on the Cleveland, Columbus, Cincinnati & Indianapolis road ran into some cars which had broken loose from a freight train near Gilead, O. Several cars were damaged and two trainmen hurt.

Very early on the morning of the 5th a freight train on the New York, Lake Erie & Western road ran into a preceding freight, which had stopped to take water at Sterling Junction, N. Y. The engine and three cars were damaged.

On the morning of the 5th a freight train on the Chicago, Pekin & Southwestern road ran into a car which had been run out on the main track at Cooper, Ill., for convenience in loading. The car was wrecked, and the engine damaged, blocking the road several hours.

On the morning of the 7th a freight train on the Ft. Wayne & Jackson road ran into a preceding freight in Ft. Wayne, Ind., wrecking a car.

On the morning of the 8th an extra freight train on the New York & New England road ran into the rear of a regular freight at the Bird street station in Boston. The engine and a caboose were damaged.

On the 9th a freight train on the Pittsburgh, Cincinnati & St. Louis road ran into the rear of another freight, which was just going into a siding at Smithfield, O., damaging the engine and several cars. The engineer jumped and was hurt.

On the afternoon of the 10th a freight train on the New York, Lake Erie & Western road ran into a preceding freight, which had stopped to take water at West Paterson, N. J. Several cars were wrecked.

On the morning of the 25th a freight train on the New York, Lake Erie & Western road ran into a preceding freight near Cochecon, N. Y., damaging the engine and several cars.

On the 27th a freight train on the Girard Point Branch of the Pennsylvania Railroad ran into the rear of another freight at Penrose Ferry road in Philadelphia, wrecking three cars.

On the evening of the 28th a freight train on the New York, Lake Erie & Western road ran into a preceding freight at the head of the yards at Hornellsville, N. Y. The caboose was wrecked and two oil cars upset and caught fire, burning up several cars.

Early on the morning of the 29th an extra freight train on the Pennsylvania Railroad ran into a preceding freight which had stopped near Petersburg, Pa., to take the third track. Several cars were wrecked, and three of them thrown over upon the other track, causing another accident, as shown elsewhere.

Late on the night of the 30th a freight train on the Lake Shore & Michigan Southern road ran into another freight at Jonesville, Mich., wrecking several cars, injuring the engineer, and blocking the road five hours.

## BUTTING COLLISIONS.

On the night of the 7th a freight train on the Lake Erie & Western road broke in two while switching near LaFayette, Ind., and the detached cars ran back at great speed down the grade and into the head of a following freight, drawn by two engines. Both engines and 10 cars were completely broken up, and one man killed.

On the morning of the 14th a switch engine ran into the head of a freight train in the Nashville, Chattanooga & St. Louis yard at Nashville, Tenn., damaging both engines and a freight car.

On the morning of the 19th there was a butting collision between a wood train and a yard engine in the St. Paul, Minneapolis & Manitoba yard in St. Paul, Minn. Both engines were slightly damaged.

On the night of the 23d there was a butting collision between a freight train and a switch engine in the Chicago, Burlington & Quincy yard at Mendota, Ill. Both engines were damaged. The switch engine had been reversed and the crew jumped off, and after the collision it started off backward and ran some five miles out on the main track, fortunately without meeting any train.

At noon on the 26th there was a butting collision between a freight and a wrecking train on the Vandalia Line, near Hunter Siding, Ill. Both engines and several cars were wrecked badly. The fireman and another man on the freight engine were killed and the engineer hurt, while the engineer and nine others on the wrecking train were injured.

On the morning of the 29th there was a butting collision between a switch engine and a local passenger train on the Atlanta & Charlotte Air Line in Atlanta, Ga. Both engines were damaged.

On the afternoon of the 29th there was a butting collision between two freight trains on the New York Central & Hudson River road in Rochester, N. Y. Both engines and several cars were wrecked and the road blocked for some hours.

## CROSSING COLLISIONS.

On the 8th a Wabash, St. Louis & Pacific freight train ran into a Cincinnati, Wabash & Michigan freight at the crossing of the two roads in North Manchester, Ind., damaging an engine badly.

On the morning of the 28th a Chicago, St. Louis & New Orleans freight ran into a Louisville & Nashville passenger train at the crossing in Milan, Tenn., upsetting a passenger car and injuring a passenger.

## DERAILMENT, BROKEN RAIL.

On the morning of the 26th a passenger train on the Atchison, Topeka & Santa Fe road struck a broken rail near Sargent, Kan., and three cars were thrown from the track and down a bank. The cars were badly broken, killing one person, injuring two others fatally, and 13 more less severely.

## DERAILMENTS, BROKEN AXLE.

On the afternoon of the 15th the engine of a passenger train on the Port Jervis and Monticello road was thrown from the track near Gillet's Siding, N. Y., by the breaking of a driving axle.

On the morning of the 17th an axle broke under a car in a

freight train on the Pennsylvania Railroad near Linden, N. J., and four cars were thrown from the track, piled up together and wrecked, blocking two of the three tracks for an hour.

## DERAILMENT, BROKEN TRUCK.

On the morning of the 14th five cars of a freight train on the New York, Lake Erie & Western road were thrown from the track near Pine Grove, Pa., by the breaking of a truck.

## DERAILMENT, BROKEN BRIDGE.

About noon on the 8th, a freight train on the Houston & Texas Central road went through a burning bridge over Big Sandy Creek, near Brenham, Tex. There was a sharp curve close to the bridge, and the engineer did not see that it was on fire until it was too late to stop the train. All the trainmen jumped and were saved.

## DERAILMENT, SPREADING OF RAILS.

On the morning of the 11th, five cars of a freight train on the Chicago and Grand Trunk road were thrown from the track near Dodgeville, Mich., by the spreading of the rails, said to have been caused by the great heat.

## DERAILMENT, WASH-OUT.

Very early on the morning of the 15th, the engine of a freight train on the Cleveland & Pittsburgh road was run upon a spur track at Bridgeport, O., to get some cars. The bank had been washed away during the night, leaving no support to the rails, and the engine went down into the gap and was wrecked, injuring the engineer and fireman.

## DERAILMENTS, CATTLE.

About noon on the 14th a passenger train on the Connoton Valley road ran over a cow near Oneida, O., and the engine was thrown from the track.

On the afternoon of the 19th a passenger train on the Savannah & Charleston road ran over a mule near Savannah, Ga., and the engine and baggage car were thrown from the track and damaged, injuring the engineer, fireman and wood-passer.

On the evening of the 24th a passenger train on the Western Maryland road ran over a cow near Chewsville, Md., and the rear car was thrown from the track and damaged, injuring two persons.

On the afternoon of the 30th a passenger train on the Chicago, Burlington & Quincy road ran over a cow near Meriden, Ill., and two cars were thrown from the track and upset, damaging them badly and injuring 13 passengers slightly.

On the evening of the 30th a freight train on the Baltimore & Ohio road ran over a cow near Newark, O., and the engine and several cars were thrown down a bank and badly broken. The fireman was hurt.

## DERAILMENTS, ACCIDENTAL OBSTRUCTION.

On the 18th an accident from a singular cause happened at the bridge over the Scioto River, near Chillicothe, O., on the Dayton & Southeastern Railroad. James Duffy, bridge watchman, laid down beside the track and went to sleep, with an arm over the rail. A gravel train backed down on him, and the entire train was thrown from the track. Five men were thrown into the river, and twelve others into the debris of the wrecked train. The bridge-watchman and two of the laborers were fatally hurt; one laborer was killed at once, and the remaining 14 men were not very badly hurt.

Early on the morning of the 29th an east-bound freight train on the Pennsylvania Railroad ran into the wreck of some cars, which had been thrown over upon its track by a collision on the west-bound track a minute before, near Pittsburg, Pa. The engine was thrown from the track and damaged, the engineer and fireman killed; it is thought that they jumped and were caught in the wreck.

## DERAILMENTS, MISPLACED SWITCH.

On the morning of the 8th a freight train on the Great Western Railway was thrown from the track at Simcoe, Ont., by a misplaced switch. The engine and several cars were wrecked, and the wreck caught fire and was burned up. The engineer was killed.

On the 8th the engine and several cars of a passenger train on the Lake Shore & Michigan Southern road were thrown from the track at Corunna, Ind., by a misplaced switch. The engineer was hurt.

On the morning of the 9th a passenger train on the Illinois Central road was thrown from the track near Independence, Ia., by a misplaced switch. The engine was damaged and the engineer badly hurt.

On the 15th a freight train on the Southern Pacific road was thrown from the track at Santa Clara, Cal., by a misplaced switch. The engine and five cars went into the ditch and were badly broken, injuring the fireman.

On the morning of the 16th a passenger train on the West Jersey road was thrown from the track by a misplaced switch at Wenonah, N. J. The engine was damaged, the engineer hurt and the road blocked two hours.

On the night of the 30th a freight train on the Cincinnati, La Fayette & Chicago road was thrown from the track in Kankakee, Ill., by a misplaced switch. One car ran across the platform and into the passenger depot, doing much damage.

## DERAILMENTS, UNEXPLAINED AND MISCELLANEOUS.

On the 8th a car of a freight train on the Northern Pacific road ran off the track in Bismarck, Dak., on the ferry transfer track.

On the 8th a car of a passenger train on the Denver & Rio Grande road ran off the track in West Denver, Col., and upset, doing some damage.

On the morning of the 11th a freight train on the Canada Southern road ran off the track near St. David, Ont., and the engine went down a high bank. Three trainmen and two tramps (who were stealing a ride) were hurt.

On the 11th a passenger train on the Savannah, Florida & Western road ran off the track near Pelham, Ga., damaging several cars and injuring the engineer.

On the 11th a freight train on the St. Paul & Duluth road ran off the track near Harris, Minn., and nine cars went into the ditch and were wrecked.

On the afternoon of the 16th a switching freight train on the Pennsylvania Railroad ran off the track in the yard at Meadows, N. J., wrecking several flat cars.

On the 17th the engine of a freight train on the Northern Pacific road ran off the track at Burton, Dak., blocking the road for a time.

Very early on the morning of the 21st a freight train on the Pennsylvania Railroad was thrown from the track in Elizabeth, N. J., and two cars were wrecked, blocking the road four hours.

On the 21st four cars of a freight train on the Indianapolis, Decatur & Springfield road were thrown from the track near Indianapolis, Ind., doing some damage.

On the night of the 25th a freight train on the Vandalia line ran off the track near Confidence Hill, Ill., wrecking several cars.

On the morning of the 26th a freight train on the Marietta & Cincinnati road ran off the track near Martinsville, O. The engine and several cars were wrecked, killing the engineer and fireman and blocking the road four hours.

On the afternoon of the 30th two cars of a freight train

on the Cincinnati, Indianapolis, St. Louis & Chicago road ran off the track in Indianapolis, Ind., blocking the road two hours.

On the night of the 30th, as a freight train on the Chicago, Milwaukee & St. Paul road was backing on a siding in the yard at St. Paul, Minn., it ran too far, and two cars were pushed off the end of the track and down a bluff into the river.

## OTHER ACCIDENT.

On the night of the 30th, as a passenger train on the Old Colony road was backing out of the depot at Newport, R. I., one of the driving axles of the locomotive broke and the driving wheel fell to the ground. The engine was not thrown from the track.

This is a total of 56 accidents, whereby 15 persons were killed and 77 injured. Seven accidents caused the death of one or more persons each; 16 caused injury but not death, leaving 33, or 58.9 per cent. of the whole number in which no serious injury to persons is recorded.

As compared with June, 1879, there was a decrease of eight accidents, a decrease of three in the number killed and an increase of 22 in that injured.

These accidents may be classed as to their nature and causes as follows.

COLLISIONS	
Rear collisions	13
Butting collisions	7
Crossing collision	2
	—22
DERAILMENTS:	
Broken rail	1
Broken axle	2
Broken truck	1
Broken bridge	1
Spreading of rails	1
Wash-out	1
Cattle on track	5
Accidental obstruction	2
Misplaced switch	6
Running off end of siding	1
Unexplained	12
	—33
Broken axle not causing derailment	1
Total	56

Two collisions were caused by trains breaking in two and one by stupidity of laborers in running a car on the main track to unload, without putting out a signal. An unusual number of collisions are unexplained.

A rough classification shows eight accidents caused directly by defects or failure of road or equipment; two by the elements or the weather; seven by unforeseen or accidental obstructions; 27 by carelessness or defects in management while 12 were unexplained.

The time of 36 accidents was during daylight; of 15 at night, while in five cases the time is not recorded.

A division according to classes of trains is as follows:

Accidents:	Colli-	Derail-	Other	Total.
sions.	ments.	Accidents.		
To passenger trains	11	1	12	3
To a passenger and a freight	3	..	..	3
To freight trains	19	12	..	41
Total	22	33	1	56
Casualties:				
Killed by	3	12	..	15
Injured by	19	58	..	77
Total	22	70	..	92

There is nothing in the month's record to call for special remark; except, perhaps, that there was an unusually large proportion of collisions, and particularly of butting collisions. June is not generally a bad month, and this June is no exception, though there were several accidents with a pretty large number of injuries to persons. The accidents incidental to the season appear, such as cattle on track and wash-outs, though there was only one from the last-named cause. Misplaced switches continue to be unpleasantly numerous, and there were two crossing collisions—accidents almost surely the result of carelessness, either in using or obeying signals. The only broken bridge was partially burned before it gave way under a train, and cannot fairly be counted as a defective bridge.

For the year ending with June, the record is as follows:

	Number of accidents.	Killed.	Injured.
July	81	14	54
August	79	19	59
September	78	8	47
October	104	35	96
November	86	16	64
December	69	18	72
January	62	11	50
February	64	16	49
March	65	9	33
April	71	11	45
May	46	30	107
June	56	15	77
Totals	861	202	753
Totals, same months 1878-79	810	206	794

The averages per day for the month were 1.87 accidents, 0.50 killed, and 2.57 injured; for the year they were 2.35 accidents, 0.55 killed, and 2.06 injured. The average casualties per accident were, for the month, 0.268 killed and 1.375 injured; for the year, 0.235 killed and 0.875 injured.

## The Late President D. Waldo Lincoln.

At the special meeting of the Boston & Albany stockholders in Boston, July 15, Ex-Governor Bullock, Chairman of the committee appointed at the last meeting to prepare resolutions in regard to the death of the late President Lincoln, prefaced his report with feeling remarks. However true it may be that no man is essential in the commonwealth, yet the fact that such a man has passed away is one of more than common moment. The history of the connection of Mr. Lincoln with the road as President is not surpassed by that of any of his predecessors. For his moral qualities, Mr. Lincoln won the respect and love of the stockholders and the people. He regarded his office as a public trust. Averse to hypocrisy and disingenuousness, he was animated in his conduct toward all by the highest spirit of truth and justice. He continually kept himself clear from all conduct which would require explanation. His death is a public calamity, and we owe it to the commonwealth that we should



publicly recognize this fact. The resolutions were then read as below:

*Resolved*, That, with a keen sense of the loss which has fallen upon this company, we deplore the death of its President, the Hon. Daniel Waldo Lincoln. As a director for many years of the Boston & Worcester Railroad Company, and for a long term of service as director and Vice-President of the Boston & Albany Railroad Company, after the consolidation, and subsequently as its President, he had become widely known and honored for his clear and comprehensive understanding of the interests alike of the stockholders and the general public; for his delight and punctilious fidelity in every official duty; for the high sense of personal honor which marked his administration; for his capacity in uniting whatever was conservative with whatever was progressive in the extended business over which he presided; for his firmness and his gentleness in dealing with conflicting interests, and for the spirit of justice which appeared in every relation into which he was brought.

*Resolved*, That we recall with pride and satisfaction the private character which our late President took into official stations, and which he never weakened in any contact; his eminent personal integrity, which shone not by ostentation but by use, and which not only guided his own conduct of affairs but impressed all who were associated with him; and, at a time in which such examples are needful for the common welfare, we hold him up for general observation as a conspicuous illustration of the truth that the whole commonwealth is benefited whenever the head of one of her corporate bodies gives by his practice an added sanction to the precepts of public morality and virtue.

*Resolved*, That these resolutions be entered upon the records of the corporation, and that a copy be forwarded by the clerk to the family of our late President, in token of our profound respect and sympathy.

The resolutions were seconded by Hon. E. B. Gillette of Pittsfield, who paid a glowing tribute to the personal character of the deceased, and spoke eloquently of the high regard which intimate personal acquaintance had caused him to cherish.

George S. Hale, Esq., narrated many incidents of Mr. Lincoln's life. He said:

"I ask permission, Mr. President, to say a few words upon the resolutions which you have read—not with the hope of adding anything, by grace of speech, to the fitting tributes which have been already paid to the man they justly eulogize by those who are better qualified to speak, and better entitled to be heard, but with the desire to bear my testimony to his admirable qualities—to speak of that which I know, and testify to what I have seen. I cannot speak of the early life of Mr. Lincoln. My acquaintance with him began with his first connection with a portion of the vast organization with which his services, his name and his memory are now inseparably and permanently associated; and more recently, for many years our official, and, I am happy to add, our personal, our social and friendly relations have brought me into constant, continuous and confidential intercourse with him, under such circumstances that while no peculiar capacity for estimating character was required to see and appreciate the real worth and weight of his, it would have been difficult to conceal weaknesses or simulate strength. I said 'conceal.' Mr. President, but with Mr. Lincoln there was nothing to conceal, and no pretense. Concealment was alien to his nature. He was 'an Israelite indeed, in whom was no guile.' Directness, simplicity, fidelity and integrity were the leading features of his character, and the fine intellectual qualities which these moral elements imply, which they educate, develop and strengthen, were his.

"His object was plainly set before him and he sought it by no tortuous paths. It was not in him to disguise that object by any pretense, nor was it in him to swerve from the duty it set before him, or to be affected in the performance of that duty by personal interests. He never thought of getting the better of another in his bargains. Justice was the advantage he sought, and as other men came to know this in their dealings with him, they were influenced to imitate him. Truth has been said to be the best diplomacy. Fair dealing made him a successful manager of the large interests committed to his charge. If he was ever impatient in these it was with the chicanery or trickery which he seemed not only incapable of practicing but hardly able to understand. It was but yesterday, it seems to me, that in a transaction in which some one had dealt with him in a manner which I can best characterize by saying that it would never have occurred to him to attempt it, that the offender's counsel said to me: 'Such a thing is so averse to Mr. Lincoln's nature, he is so incapable of it, so open, fair and straightforward himself that he could not tolerate it.'

"I spoke of the intellectual qualities which naturally accompanied his high moral traits. They gave weight, force and eloquence to his composition and his speech.

"Who is that man? said an able, cultivated and intelligent member of the bar to me within a few months, as he sat by my side listening to the remarks Mr. Lincoln was addressing to a committee in opposition to his clients. 'Do you not know him?' I replied, as I gave his name. 'Whoever he is,' said my friend, and our temporary opponent, 'he is a first-class man.'

"Waldo Lincoln," said another, years ago, who knew him before you or I shared his friendship—knew him in the close relations of home and domestic life—and among others with whom his position enabled him to make comparisons, 'Waldo Lincoln is a prince in disguise.' As time passed on, those around saw through the disguise, which a retiring nature and a modest disposition threw around him.

"By two wings," said old Thomas à Kempis, 'man is lifted up from things earthly—namely, simplicity and purity.'

"There are other qualities and relations not to be spoken of at length here, but we cannot wholly separate such a man in his daily duties from his home, his family and his friends. I have shared his gracious hospitality. I know how those whom he daily left in the morning welcomed him in the evening. We cannot forget

"What a cruel sense of loss  
Like a black shadow must fall across  
Those loving hearts, since he hath died.  
His gracious presence upon earth  
Was as a fire upon a hearth.  
As pleasant songs at morning sung  
The words that dropped from his sweet tongue,  
Strengthened their hearts, or heard at night  
Made all their slumbers soft and light."

The resolutions were passed unanimously by a rising vote.

## Contributions.

### Wear of Swing-Motion Trucks.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In the *Gazette* of Dec. 19, 1879, Mr. Kirby contributed a paper on the wear of swing-motion trucks. Any article relating to the wear and tear of cars on our railroads is very interesting to those who are employed in their construction

or repairs, and especially so when it comes from one with the experience of Mr. Kirby. Still, after reading the paper and studying the diagrams, I am led to the conclusion that by his method he simply reduces the wear on the mandrel-pin or cross-bar and transfers it to the hanger, because there must be some wear in a swing-motion truck, as well as fatigue of iron, or it would not be swing-motion. True, he uses a larger surface for friction by putting the casting between the hanger and mandrel-pin; yet, after all, it is a better plan than the old one.

But it is not my purpose to find fault, but to explain a

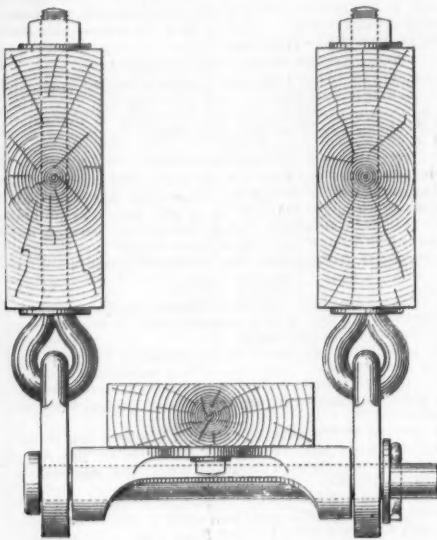


FIG. 1.

plan of hanger which is in use on several roads in Missouri, and which has been used a number of years with good results. It is known as the "link-hanger," and is shown in the diagram, figs. 1 and 2. Fig. 1 shows the bolt-link mandrels and castings attached to the truck transoms and sand-board. Fig. 2 is a side view of the same. There is also used, but not shown in the diagram, a "safety guard," made of 1-in. iron, and bent to the desired shape, which passes through the transom timbers of trucks, and under the sand-board, so that in case of a hanger giving way, the beam and sand-board rest safely on the guard until it arrives at its destination, where it can be repaired.

The mandrel-pin is made out of 1½-in. iron, and is forged

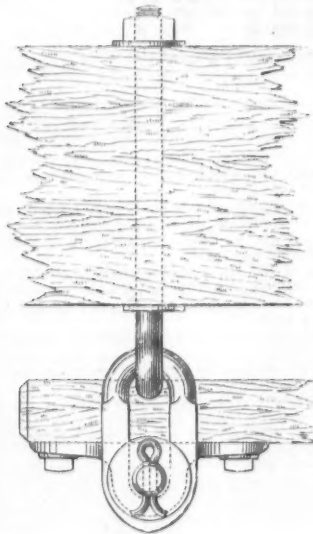


FIG. 2.

with a head on one end, with a key in the other end. We find it safer to have a head on one end, as there are fewer keys to work out. In case of a wreck, the truck transoms are not so badly damaged, because when the trucks leave the rails the link-hanger on striking the ground turns up, and very little damage is done to the transoms on account of the hangers tearing the timbers. On the other hand, where the "loop-hanger" is used, and a mortise made through the transom to allow of side play of hanger, the timbers of the truck are invariably torn to pieces by the loop-hanger striking the ground and bending up, tearing out the mortise. For a wooden swing-motion truck, this hanger is a success, but the time is now at hand when very few wooden trucks will be built by those who study economy in running rolling-stock. When I say wooden trucks, I mean those with wooden "cross berths" or transoms. The iron truck complete is destined to be the "truck of the future."

THOS. AYLESBURY.

### Questions for Roadmasters' Convention.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The following list of questions have been proposed to the Committee on Questions for Discussion at the forthcoming convention of the International Roadmasters' Association, to be held at Chicago, Sept. 8. Out of the entire list a selection of six to ten will be made hereafter by the committee,

and we shall be obliged for suggestions as to which to select, from any one interested.

It may be well to mention that the last convention was principally occupied with discussions on ties, and on frogs and switches.

CHARLES LATIMER,  
CLEVELAND, O., July 14, 1880. Chairman.

### LIST OF QUESTIONS.

1. Comparative action of frost on different materials composing road-bed, and best mode of obviating heaving.
2. Best form of road-bed. Best distance of ditches from end of ties and depth below them.
3. Best manner of ballasting with rock. Whether to use crusher or break with hammers.
4. Saving in cost of repairs and wear of rail by using rock ballast, with actual figures.
5. Comparative merits of various kinds of ballast.
6. Contraction and expansion; extent of the difficulty and best mode of prevention.
7. Best mode of preventing creeping of track, with actual results.
8. Spikes.
9. Comparative merits of laying rail with square joints or broken joints.
10. Lining and surfacing track, and how to keep it up best, especially on an indifferent road-bed.
11. Elevation of curves. Is it safe to exceed a certain elevation, and what should be the maximum? Should the outer rail be elevated or the inner rail depressed?
12. Adjusting the elevation on reversed curves.
13. Comparative life of different kinds of ties.
14. Information as to preserving ties, especially from actual experience.
15. Best method of putting in ties.
16. Quality of the different makes of steel.
17. Best length of rail.
18. Best weight and size of rail for standard-gauge roads.
19. Uniform rule for punching or drilling steel.
20. Are flat wheels an important cause of breaking steel rail?
21. Are elliptic springs for freight cars an important saving to the track?
22. Best form of joint for 60-lb. rail. Is not the plain or angle fish-plate better than any suspended joint? (A number of correspondents suggested this question.)
23. Best nut-lock for track bolts.
24. Comparative merits of various switches, with actual statistics of life and tonnage.
25. Do., for frogs.
26. Safety of plain rail frog as compared with Mansfield or other elastic frog.
27. Should long or short ties be used for frogs and switches?
28. Best mode of planking highway bridges; at right angles or diagonally?
29. Best form of gate for farm crossings.
30. Best railroad fence, cost and durability considered, with especial reference to wire fence.
31. Best hand-car, shape, weight, length, and size of wheel, with actual figures so far as possible.
32. Propriety of keeping so-called "second hands" to draw from to fill vacancies of section foremen.
33. Are extra gangs expedient, or should the regular force alone be used?
34. Should men be allowed to smoke during working hours, and if so, under what regulations?
35. Are boarding cars expedient for a road over 300 miles long, and what is the best mode of working them?
36. What is the best method of clearing light and heavy snow off the track? Is there any plow that can be especially recommended?

### Watkeys' Valve-Seat.

The wear of locomotive valve-seats is like poverty, it is always with those in charge of the machinery of railroads. The device illustrated herewith is intended to facilitate the operation of truing-up this part of locomotives by making it removable for that purpose.

The engravings represent two methods of constructing it, the one, figs. 1, 3 and 7, as applied to old cylinders, and figs. 2, 4 and 6, the method used for new cylinders.

The arrangement consists of a false seat, which is fitted to the top of the cylinder, as shown in figs. 1 and 2. Figs. 3 and 4 represent plans of the top surface of the cylinder on which the removable or supplementary seat rests, and figs. 6 and 7 plan views of the seats themselves, fig. 5 being a transverse section of the cylinder, which is the same for both methods of applying the seat.

When it is put on an old cylinder the top of it is planed off flush with the surfaces on which the steam-chest rests. The valve-seat is then simply laid on top of the cylinder inside of the steam-chest, and is held in its place by set screws, shown in figs. 1 and 7. Besides this it is let into recesses in the sides of the steam-chest, as shown in fig. 5. This is done to prevent the back pressure from lifting it when the engine is reversed.

When this seat is applied to new cylinders, they are made with lugs on top which form a recess for it, as shown in figs. 2 and 4. It is then made of the form shown in fig. 6, and is simply dropped into the recess and held in position longitudinally by the lugs. It is prevented from lifting by the recesses in the sides of the steam-chest.

Of course every master mechanic is familiar with the method of repairing cylinders which have become much worn, by bolting or riveting a valve-seat on the old cylinder. The advantage of the arrangement which Mr. Watkeys uses is that it is not confined rigidly by bolts or rivets, and



is therefore free to expand or contract and can easily be kept tight on the surface where it joins the cylinders. Being easily removable, in turning up the valves the seat is lifted out and placed on a work-bench where the work can be done in the most convenient and expeditious manner.

This device has been applied to a large number of engines on the New York Central Railroad by Mr. Watkeys, and is said to give excellent satisfaction. He will doubtless be glad to give any information concerning it that may be desired. His address is H. Watkeys, Syracuse, New York.

#### Investigation of the Tay Bridge Disaster.

[Report of the Court of Inquiry upon the circumstances attending the fall of a portion of the Tay Bridge on the 28th of December, 1879.]

LONDON, June 30, 1880.

To the Right Honorable the President of the Board of Trade.

SIR: Having by your order of the 31st of December last been directed to hold a formal investigation under the provisions of the "Regulation of Railways Act, 1871," into the causes of and the circumstances attending an accident which took place on the railway bridge crossing the Firth of Tay, on the North British Railway, on the twenty-eighth of that month, we at once proceeded to Dundee for the purpose of making a personal inspection of the bridge and of examining any witnesses who would give evidence as to the circumstances attending the accident while the facts were still fresh in their memories. The inquiry was opened on Saturday, the 3d, and was continued on Monday and Tuesday, the 5th and 6th of January. Mr. Trayner appearing for the Solicitor of the Board of Trade, and Mr. Balfour for the North British Railway Company. Having by that

June 26, 1874, another contract was entered into with Messrs. Hopkins, Gilkes & Co., of Middlesborough, to complete the work. The new contractors agreed to take over from Messrs. De Bergue the whole of the existing staff and plant, as well as a foundry which had been erected at Wormit, near the southern end of the bridge, where a large portion of the castings required for the works were made.

The bridge was designed by Sir T. Bouch, and the supervision of its construction was entrusted to him up to the period of its being opened for traffic. He was subsequently charged by the North British Railway Company with its maintenance, and remained so charged up to the date when the structure fell.

1. The bridge, as originally designed, and as referred to in the specifications, had piers of brick-work and spans of 200 feet of clear water space in that portion of it which forms the subject of this inquiry; but in consequence of difficulties with the foundations, Sir T. Bouch altered the spans to 245 feet, excepting two, which were made 227 feet; and he also altered the piers from brickwork to iron-work above high water level, in order to lessen the weight on the foundations, and to obtain the best distribution of weight and material which the circumstances permitted. It should be added that the proposal to alter the piers from brick to iron was made before the contract was entered into with Messrs. Hopkins, Gilkes & Co., but the final designs were not settled until afterward; and there is a letter from Mr. Gilkes to Sir Thomas Bouch, dated the 9th of June, 1875, in which he speaks of the proposed "enlargement of the spans and certain alterations of the piers," which he states had, after "long and careful consideration," been at length decided on. From this time the work progressed with great rapidity, a large number of men being constantly employed both on the bridge itself and at the Wormit foundry; and although some delay occurred from the fall, during a heavy gale of wind, of two of the large iron girders whilst they were being raised into their posi-

first, counting from the south, contained five spans of 245 ft. each; the second of four spans, two of 245 and two of 227 ft. each; and the third of four spans, all of 245 ft. each. There were expansion joints on piers 28, 33, 37 and 41; fixed bearings on piers 31, 35 and 39; and roller bearings on the seven remaining piers 29, 30, 32, 34, 36, 38, and 40.

The girders in this part of the bridge were 27 ft. high, and 14 ft. 10 in. apart from centre to centre. The two upper booms were braced together at intervals by wrought-iron struts and diagonal ties; but the lower booms, which carried the permanent way, were connected by transverse wrought-iron girders, placed about 5 ft. 5 in. apart, riveted to the upper side of the bottom booms. On the whole the girders appear to have been carefully proportioned to the strains which they had to bear; and as there is no reason to suppose that the casualty was in any way due to defects in the girders it is not necessary to describe them more fully.

Assuming the permanent way on the fallen part of the bridge to be similar to that on the part left standing, it was strongly constructed and properly fish-jointed, and had strong guard rails also fish-jointed, and was kept in very good order.

The piers which supported the high girders were of peculiar construction, the nature of which is fully described in Mr. Law's report, and as they were evidently the first portion of the structure that yielded from some cause, it becomes necessary to refer to them more in detail. The foundations were formed by constructing wrought-iron caissons, 31 ft. in diameter, which, having been lined with 18 in. of brickwork, were floated out and sunk in their proper places. This was an extremely difficult operation, but appears in every instance to have been successfully performed. After sinking the caissons as low as was deemed necessary, the centre was filled up with concrete, and upon this was built an hexagonal shaped pier, measuring 27 ft. 6 in. long and 15 ft. 6 in. broad. The lower part of this pier was made of concrete faced with brick, and was surmounted by four courses of

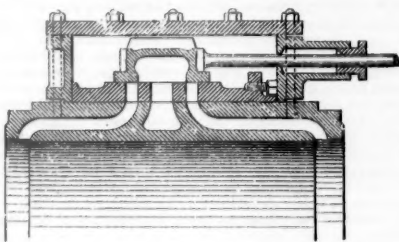


Fig. 1.

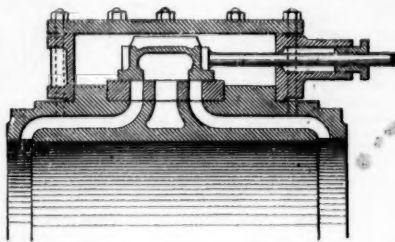


Fig. 2.

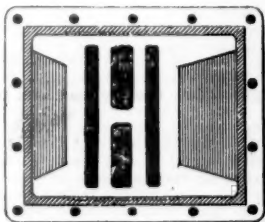


Fig. 3.

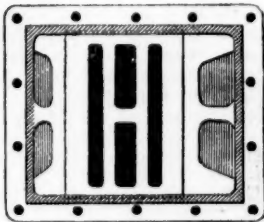
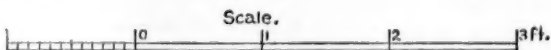


Fig. 4.



WATKEYS' IMPROVED VALVE-SEAT.

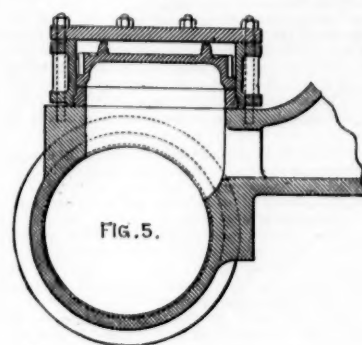


Fig. 5.

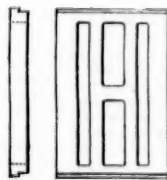


Fig. 6.

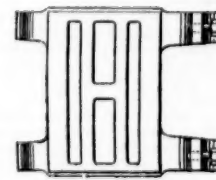


Fig. 7.

time examined all the witnesses whom the parties were then prepared to produce before us, as well as having made an inspection of the bridge, we adjourned the further hearing of the case in order to allow time to procure such information as to the details of its construction, and as to its present state and condition, as seemed to be necessary for the purpose of our inquiry. With this view we appointed Mr. Henry Law, a member of the Institute of Civil Engineers, with directions to make a minute and careful examination of the bridge and to report to us fully thereon, as well as on the probable cause of the accident, and to select specimens of the cast and wrought iron, also portions of the cross-bracings and its fastenings, and of the connecting bolts of the columns, etc., to be subjected to test at Mr. Kirkaldy's establishment at Southwark. We also called the railway company to furnish us with particulars of the weight, strength, and dimensions of the various parts of the structure. Photographs of the piers, of portions of the fallen girder and permanent way, and of the remains of the engines and carriages were ordered to be prepared and laid before us.

Whilst waiting Mr. Law's report, and for the answers of the railway company to the questions addressed to them, we were told that there were a number of witnesses at or near Dundee who could give information as to the condition of the bridge before the accident. We accordingly again went to Dundee, and between Thursday the 26th of February, and Wednesday, the 31st of March last, a number of witnesses were examined, mainly with reference to alleged defects of workmanship, and inferior quality of materials used in the bridge, and also as to the speed at which the trains crossed it.

At length Mr. Law's report, dated the 9th of April, as well as the answers from the railroad company, having been received, and the case appearing to be otherwise ready for hearing, the inquiry was resumed at Westminster on Monday, the 19th of April, and between that day and Saturday, the 8th of May, when it was brought to a close, a large number of witnesses were examined. On this occasion Sir Thomas Bouch, the Engineer, and Messrs. Hopkins, Gilkes, & Co., the contractors appeared by separate counsel; Mr. Bidder representing the former, and Messrs. Webster and Macrory the latter. Mr. Trayner and Mr. Balfour appearing, as before, for the Solicitor of the Board of Trade and the railway company respectively. Reports were also brought in from Mr. Kirkaldy, showing the results of the tests.

From the information which has been laid before us, it would seem that a company having been formed to build a bridge, and an act obtained for the purpose, a contract was on the 1st of May, 1871, entered into with Messrs. De Bergue & Co., to undertake the work.

In consequence of the illness of Mr. Charles De Bergue, the leading partner in the contractor's firm, and his inability to attend to business, it became necessary to transfer the contract to other hands. This was accordingly done, and on

tions, together with the piers on which it was proposed to place them, the bridge was completed, if not within, at all events very soon after, the stipulated time.

The bridge was 3,465 yards in length. The superstructure was of wrought-iron lattice girders, except one span on the northern portion, which was crossed by bow-string girders.

Each lattice girder was complete in itself, but they were connected together so as to form continuous girders extending over groups of four, five and six spans.

The spans of the bridge varied from 245 ft. to 29 ft. The piers were 85 in number, of which the first 14 were of brick, the remainder being formed above high water level of tiers of cast-iron columns bolted together vertically by bolts and nuts, and connected laterally by means of cross-bracing and struts of wrought iron. The number of columns in position on each pier varied from three to six. Those under the largest spans were formed of six columns, bolted to base pieces, which were bedded in stone. The lower portions of these piers consisted of concrete, brickwork and masonry, their construction being accomplished by means of iron caissons which were left in forming part of the permanent work.

Commencing from an abutment on the south shore, the bridge curved for the first three spans to the left until it came at right-angles to the course of the river, where here runs nearly due east and west; it was then straight to pier 53, whence it curved sharply off to the right with a radius of 20 to 22 chains, until it finally reached the north shore. For the first three spans after leaving the south shore, the roadway fell slightly; from piers three to six it was level; it then rose on a gradient of 1 in 353 until it reached pier No. 29; from 29 to 30 the gradient was 1 to 490; it was then level for six spans, and at pier 36 it began to fall, the gradient from 36 to 37 being 1 in 130, after which the fall was 1 in 74 until it reached the north shore. The summit level of the bridge, 88 ft. above high-water mark, extended from pier 30 to pier 36, whence it fell gently to the south, but rapidly toward the north, the land on the south shore being much higher than on the north.

At piers 28 and 41 the girders were raised so that the lower booms were on a level with the upper booms of the girder south of 28 and north of pier 41; the object was to give additional headway to passing vessels, it being here that the bridge crossed the navigable part of the river. The roadway from the south shore to pier 28, and again from 41 to the north shore, being carried on the upper booms, and therefore above and on the top of the girders, whilst between piers 28 and 41 it was carried on the lower booms, inside the girders. It was this portion, called the high girders, which fell, and it is therefore to this part of the bridge that attention must be more particularly directed. The high girders extended over 13 spans, namely, 11 of 245 ft. each, and two of 227 ft. each, making a total of 3,149 ft. This portion was divided into three sections or groups, the

stone backed by concrete. On this pier was placed at the angles of the hexagon six cast-iron base pieces, 2 ft. in height, and secured to the pier by holding-down bolts, 1 1/4 in. in diameter, passing through two courses of stone, each 15 in. in thickness.

Upon these six base pieces were fixed six cast-iron columns; piers 28 and 41 consisted of six tiers of columns, and those from 29 to 40 inclusive consisted of seven tiers.

The columns were cast with flanges which were fastened to each other and to the base pieces by eight connecting bolts 1 1/4 in. in diameter. They had also an inner projecting rim or spigot about 3/4 of an inch deep, fitting into a corresponding recess in the adjoining column.

The columns after they were erected were filled with Portland cement concrete poured in from the top.

The cross-bracings of the piers consisted of wrought-iron flat tie bars 4 1/2 in. by 1/2 in. in section, fastened at their upper extremity by means of wrought-iron pins passing through lugs, cast with and forming part of the columns; at their lower extremities there were two wrought-iron sling plates fastened by similar wrought-iron pins to other lugs, cast in like manner on the lower part of the columns adjacent to the flanges. The sling plates, 3/4 of an inch thick, which were of equal width and placed on each side of the tie bars, were connected to them by gibs and cotters, by means of which the cross-bracing was tightened up and brought to its bearings. The horizontal struts consisted of two channel irons, bolted by two bolts at each end to other lugs similarly cast with the columns. The channel irons did not abut against the sides of the cast-iron columns.

Of the six columns forming each of these hexagonal piers, the two extreme east and west columns were of 18 in. external diameter, 1 1/2 inches thick, placed 21 feet 10 inches apart from centre to centre, and these had an inclination of 12 inches toward the centre in a plane at right angles to the line of the bridge. The four inner columns, which were 15 inches diameter, and placed at a distance from east to west of 9 feet 10 inches, and from north to south of 12 ft., had each an inclination inward of the same amount. The effect of this inclination was that whilst the distance of the outer column from the line joining the two next inner columns was six ft. at the base, the distance at the tops of the columns was only five ft., and whilst the two inner columns were 12 ft. apart at their bases, the tops were only 10 ft. apart. The six columns formed two triangular groups, each consisting of an outer and two inner columns, the bases of the triangles being parallel to the line of the bridge. At the top of the piers each group of three columns was surmounted by a strong wrought-iron box girder, L-shaped in plan, and above each of these L-shaped girders was a wrought-iron cellular table, running north and south in the direction of the bridge, and placed immediately under the longitudinal main girders which form the sides of the bridge. Upon the upper side of the cellular table was bolted a strong cast-iron plate, a similar plate being bolted



to the under side of the longitudinal main girder of the bridge, and between these two plates were placed cast-iron rollers, each two ft. long and five in. in diameter, with flanges of  $\frac{3}{4}$  of an inch deep, except at the piers where there were fixed bearings, at which piers the longitudinal main girder was attached directly to the cellular table by bolts and nuts.

The two main girders, between which the permanent way was carried, were supported upon the L-shaped box girders in such a position that about one half of the weight of each main girder was borne by the outer column (18 in. in diameter) of each group of three columns, and the other half rested on the two inner columns (15 in. in diameter). The two L-shaped box girders were not connected together, and did not form one entire girder across the top of the piers, but the columns were connected together at the top of the piers by the struts of the cross-bracing.

The strength given to the columns as designed was sufficient for the duty they had to perform in bearing vertical weights evenly distributed.

II. In regard to imperfection of workmanship and fitting, it appears that as the substitution of iron for brick piers in this part of the work was made after the contract was let, there are no clauses in the specification describing the class of workmanship to be employed in them.

The stipulation in the general specification, which requires all the holes in the flanges of the columns to be drilled, was not carried out in this part of the work as regards the holes in the flanges of the 18 in. columns. The holes in the lugs on the columns were all cast and left conical, instead of being drilled, thus causing the pins to have unequal bearings. Some of the sling plates which were made or altered at the works were roughly formed.

Imperfection of workmanship was also found in the bolt holes of the struts, and as the struts did not abut against the columns, as in our opinion they ought to have done, their action in these cases depended on the friction or resistance to movement made by bolting the channel irons tightly together and bearing hard against the lugs.

The columns after the accident were found in some instances to be of unequal thickness, and to have other defects of casting, and it was probably due to the sluggish character of the metal and the manner in which the columns were cast that the castings of the lugs did not always turn out sound, as out of 14 tie-bars attached to lugs tested in London four showed unsoundness to a greater or less extent at the lugs.

It is stated in evidence that in some cases where lugs had turned out imperfect in casting, other lugs or portions of lugs were added by a process termed "burning on." This is admitted to have been done; but it is denied that any columns so treated were used in the permanent structure, and although a large number of broken lugs are visible in the ruins of the fallen bridge, none were found during Mr. Law's examination, nor have been otherwise brought to our notice, which appear to have been subjected to this most objectionable and dangerous process.

III. The bridge was inspected by General Hutchinson on the 25th, 26th and 27th February, at which time it was all finished and painted. During this inspection he subjected the bridge to various tests, and among others he caused six locomotives coupled together, each weighing 73 tons, to pass over the bridge at a speed of 40 miles per hour. The behavior of the bridge under these tests appears to have been satisfactory, there having been only a moderate deflection in the girders, a small degree of tremor, and no indication of looseness in the cross-bracing.

On March 5 he reported that he saw "no reason why the Board of Trade should object" to the bridge being used for passenger traffic; but that it would "not be desirable that trains should run over the bridge at a high rate of speed," and suggested "25 miles an hour as a limit which should not be exceeded," adding that "very careful attention will be required to ascertain from time to time that no scouring action is taking place in the foundations," and that he should wish, if possible, to have an opportunity of observing the effects of a high wind when a train of carriages is running over the bridge. Some delay occurred in opening the bridge, owing to the approaches on either side not being completed, but on the first day of June, 1878, it was open for passenger traffic, and from that time trains continued to run regularly across it until the evening of the 28th December last, when the disaster which we are now about to describe occurred.

IV. The train previous to that which fell with the bridge left Tayport about 5.50 p. m., and passed over the bridge about 6.5 p. m. The engine driver did not notice anything unusual in the traveling of this train, but the guard, Shand, and two men who were with him, saw sparks of fire coming from the wheels of the carriages. Shand put on his brake and showed his red light, but it was not seen by the driver; he also examined his train at the Dundee station, but finding nothing wrong made no report.

The train from Edinburgh, which fell with the bridge, arrived in due course at St. Fort station, and there the tickets of the passengers for Dundee were usual collected. We were told by the ticket collectors there were at that time in the train 57 passengers for Dundee, five or six for Broughty Ferry, five for Newport, two season-ticket holders, the engine-driver, stoker, and guard of the train, and two other guards, making 74 or 75 persons altogether. The tickets having been collected, the train proceeded on its course, leaving St. Fort station at 7.08 p. m., and on approaching the cabin which stands at the southern end of the bridge, the speed was slackened to about three or four miles an hour to enable the engine-driver to take the baton or train staff, without which he is not allowed to cross the bridge. On receiving the baton, steam was again turned on, and the train passed on to the bridge, upon which the signalman, Thomas Barclay, signaled to the north cabin signalman, the time, according to the entry in his book, being exactly 13 minutes after seven o'clock. It was then blowing a strong gale from about W.S.W., and therefore almost directly across the bridge; there was a full moon, but it was quite dark, owing to the face of the moon being obscured by clouds. It seems that a surface man in the employment of the North British Railway Company, named John Watt, had gone to keep Barclay company, and was in the cabin when the train passed; and whilst Barclay was attending to his duties, entering the time in his book and making up the stove fire, Watt was watching the train through the window in the cabin door, which looks north along the line. According to Watt, when the train had got about 200 yards from the cabin, he observed sparks flying from the wheels; and after they had continued about three minutes, there was a sudden bright flash of light, and in an instant there was total darkness, the tail lamps of the train, the sparks, the flash of light, all, he said, disappearing at the same instant.

The portion of the bridge which fell consisted of three sets of continuous girders, covering respectively five spans, four spans, and four spans, making 13 spans altogether. These continuous girders rested on rollers on all their piers except one near the centre of each set, and to these central piers they were fixed. In the accident which took place, the girders turned over and fell on their sides, each girder becoming slightly curved, the centre portion being furthest from the piers, and the ends curving toward the piers, some

irregularity showing itself in the curve at the first fallen pier from the south end.

The train was found partly in the fourth and partly in the fifth spans from the south end, so that, although it had traveled some distance along the first set of continuous girders, it never reached its northern extremity. The engine and tender were found lying on their sides on the eastern girders. The train consisted (counting from the engine) of one third-class, one first-class, two third-class, one second-class, and the guard's van. The second-class carriage and the guard's van had their bodies and all their upper portions entirely destroyed; their lower frames were greatly damaged, and the axles of these vehicles as well as those of all the other carriages were bent.

The throttle-valve of the engine was full open, and the reversing lever standing in the sixth notch from full forward gear, or in the third notch from the centre. The train was partly fitted with the Westinghouse brake, but there was no appearance of its having been put on, and the conclusion to be drawn from these facts is that neither the driver nor fireman had any warning of the accident which took place.

V. It appears in the evidence that about the time Sir T. Bouch considered the altered designs of the Tay Bridge, he had been preparing plans for a bridge over the Firth of Forth for another company. This bridge being of unprecedented magnitude as regards its spans, and several railway companies being interested in its construction, other engineers, viz. Sir John Hawkshaw, Mr. Bidder, Mr. T. Harrison and Mr. Barlow, were consulted, and it was remitted to Mr. Barlow and Dr. Pole to carry out the detailed investigation of the design. It further appears that these gentlemen, not being satisfied with their own judgment upon the question of wind pressure, consulted the Astronomer Royal, who put his opinion into writing in a letter, from which the following is an extract: "We know that upon very limited surfaces, and that for very limited times, the pressure of the wind does amount sometimes to 40 lbs. per square foot, or, in Scotland, probably to more. So far as I am aware, our positive knowledge, as derived from instrumental record, goes no further; but in studying the registers it is impossible not to see that these high pressures are momentary, and it seems most probable that they arise from some irregular whirling of the air which extend to no great distance, I should certainly say to no distance comparable to the dimensions of the proposed bridge; and I think that the fairest estimate of the pressure on the entire bridge would be formed by taking the mean of the recorded pressures at one point of space for a moderate extent of time as representing the mean pressures on a moderate extent of space at one instant of time. Adopting this consideration, I think we may say that the greatest wind pressure to which a plain surface like that of the bridge will be subjected in its whole extent is 10 lbs. per square foot."

Furnished with this opinion, Messrs. Barlow and Pole report: "We entirely concur in this opinion, which we consider highly authoritative and valuable, and we may therefore safely adopt 10 lbs. per square foot as the side pressure due to the wind for which Mr. Bouch has to provide. We may now describe the means which Mr. Bouch has adopted to provide against this side pressure: The side surface of each span exposed to the wind (but making allowance for some parts which may be assumed to bear directly on the piers) is given by Mr. Stewart at about 14,000 superficial feet. This is for one surface only, i. e., the one first exposed to the wind; but behind this there are three other similar surfaces, one about 15 ft. away, the second about 120 ft. away and the third 135 ft. away. The wind must rush past these after passing the first one; and although each will be no doubt, to a certain extent, in shelter from those in front of it, we cannot suppose that they will be free from the wind's action. Possibly it would be a fair estimate to double the surface of the front face, but, as an outside estimate, we have taken three times, or 42,000. To this has to be added 8,000 ft. for two trains which may be on the bridge, giving 50,000 square feet of surface exposed to the horizontal action of the wind. Allowing, therefore, 10 lbs. per square foot, we get a force of about 500 tons." Their conclusions, so arrived at, were adopted in the report signed by Sir J. Hawkshaw, Mr. Bidder, Mr. T. Harrison and Mr. Barlow.

Sir T. Bouch states that this report influenced his mind, and that in consequence he did not consider it necessary to make any special provision for wind pressure in the Tay Bridge.

But, we think, he must have misunderstood the nature of that report, for as it pointed out that the pressures in gusts of wind amounted to 40 lbs. or more, it was obviously necessary to provide for the pressures so arising in each of the spans of the Tay Bridge, and although the limited area of these gusts is described as not being at all comparable to that of the Firth Bridge of 1,600 ft. span, yet they might in effect be equal to the whole area in the 245 ft. spans of the Tay Bridge, and their operation might take place upon any of the spans.

It must not be understood, however, that we express an opinion as to the sufficiency of a provision for only 10 lbs. of wind pressure in a large span of 1,600 ft. It may represent an amount of force which, as applied to the whole surface, would rarely be exceeded, but, after hearing the evidence given at this inquiry, it occurs to us as possible that two or more gusts might act simultaneously on so large a span, or there might be a wind gust of unusual width.

VI. With a view to obtain information on the subject of wind pressure from the most authentic sources, we applied to the Astronomer Royal, to Professor Stokes, and to Mr. R. H. Scott, the Secretary to the Meteorological Council, and from the evidence given by these gentlemen we learn the following particulars.

It appears that the term wind pressure, as now usually employed, means the force produced by the wind when acting against and at right angles to a flat plate or disc; and it is expressed in pounds per square foot. It can be arrived at directly by the instrument known as Osler's anemometer, which consists of a flat plate or board acting against a spring with a recording apparatus, that exhibits the degree of compression produced on the spring by the action of the wind, or it can be deduced approximately from the "standard pressure," by which term is meant the height at which a column of fluid is maintained or supported by wind pressure, or it can be deduced approximately from the velocity of the wind, due allowance being made for the height of the barometer and thermometer and the hygrometric state of the air at the time, and its amount varies nearly as the surface of the plate exposed to wind action.

The relation between the pressure as obtained from a plate and the standard pressure can only be ascertained by experiments, and different experimenters have assigned different values to it. Dr. Hutton makes the ratio 1.4, others have made it as high as 2, but it is now considered to be 1.8.

The instrument used for measuring the velocity of the wind is the revolving-cup instrument, known as Robinson's anemometer. It is considered that a constant ratio exists between the velocity of the wind and that of the cups actuated by the wind. That ratio was supposed to be 3, but recent carefully-conducted experiments by Dr. Robinson place it at 2.28. More recent experiments indicate 2.4 as the ratio. As a general average result, it is considered that wind with a velocity of 20 miles per hour produces a standard pressure of 1 lb. or 1.8 lbs. per foot pressure on a flat

board, and that the pressure increases as the square of the velocity.

The diagram produced by the cup anemometer, as the apparatus is now arranged, does not enable the velocity in short periods of time to be ascertained with certainty, hence it is not possible to determine by its means the velocity in gusts of wind.

Osler's anemometer appears to afford the most direct and reliable means of ascertaining wind pressure on a flat surface.

The highest record arrived at by this instrument was a pressure of 90 lbs., which occurred on the 9th of March, 1871, at Bidstone. It is stated that the instrument was graduated only up to 40 lbs., but the marker was driven on beyond to a distance estimated to represent about 90 lbs. Excepting this one result the greatest pressure actually recorded is 50 lbs., which occurred in Calcutta; but there are numerous examples of pressure of 40 lbs., and between 40 lbs. and 50 lbs.

Professor Stokes states that the position of the anemometer may materially affect the velocity and pressures recorded by it. It may be so placed as to have partial shelter, in which case the recorded result is too small, or it may be placed in the draft passing around some obstruction to windward of it, in which case the record is too high.

Pressures deduced from wind velocities require to be received with great caution—firstly, because there is a doubt as to the accuracy of the estimated wind velocity; secondly, because there is a further doubt as to the relation between velocity and pressure; and thirdly, because the pressure is supposed to vary as the square of the velocity, so that any error in the estimated velocity becomes greatly exaggerated when turned into pressure.

Some instances of railway carriages being upset by wind are clearly established in France, India and America, and one occurred in this country on the Chester & Holyhead line in 1868.

The pressure required to overturn railway carriages may be taken to vary between 28 lbs. and 40 lbs. per square foot.

A distinction is made between the pressures of gusts of wind, and those extraordinary destructive effects which arise from cyclonic action or tornadoes, one of which is cited as having occurred at Walmer, causing great destruction, as it passed along over a width varying from 450 ft. to 700 ft., but it is not known whether the pressure was equal throughout the width at the same instant of time.

Another cyclone of somewhat similar character occurred in the Isle of Wight in November, 1877.

The movement of the recording paper as generally used with Osler's anemometer is so slow that wind gusts have the appearance of being absolutely momentary in their action, but by causing the paper to travel quicker, and by other observations, the duration of wind gusts is found sometimes to exceed half a minute, though they are generally of less duration.

As against the evidence which tends to show high wind pressures there are many facts recorded in Mr. Baker's evidence of structures of various kinds continuing to stand though unable to bear high pressures. Smallness of height or partial shelter may account for such cases, but as regards engineering structures placed high above the ground or otherwise in exposed positions, there appears absolute necessity to provide for large wind pressures.

VII. In the great majority of railway structures—namely, those made in brickwork and masonry, as well as iron bridges of moderate height and span—special provision is not required for wind pressure, because the weight and lateral strength imparted to such structures in providing for the strains due to dead weight and load is more than sufficient to meet any lateral wind pressure which can arise. Also, in girders up to considerable spans, the lateral stiffness given to them to resist the tendency to oscillation produced by moving loads at high speeds is generally sufficient to meet the requirements of wind pressures; and the evidence of Sir Thomas Bouch implies that, having provided amply for dead weight and moving loads in the Tay Bridge, he did not consider it necessary to make special provisions against wind pressure.

VIII. The report of Dr. Pole and Mr. Stuart, who were engaged in this inquiry for Sir T. Bouch, after referring to the knowledge possessed at the time of designing these piers, states as follows: "For these reasons in designing the bridge, a maximum wind pressure was assumed acting over the surface of a span and pier equal to about 20 lbs. per square foot (being more than double what Smeaton allowed for a very high wind), and the dimensions were calculated for this pressure, with the usual margin of safety." It appears Dr. Pole and Mr. Stuart were wrongly informed on this subject, as Sir T. Bouch stated that he did not make any special provision for wind pressure.

The calculations of the action of wind pressure on open-work girders necessarily involve some assumptions. In those made by Dr. Pole and Mr. Stewart, and also by Mr. Law (who was employed by the Court), it is assumed that the pressures per unit of surface acting upon the leeward girder, so far as it is exposed to the wind, were one-half those acting on the windward girder. And on this assumption Dr. Pole and Mr. Stewart calculate that, with a wind pressure of 20 lbs., the stress on the minimum section of the wind-ties running east and west at the lowest division of the pier would be:

With no train on the bridge..... 5.21 tons per inch.  
With light passenger train over one pier..... 6.79

It is observed that in making this calculation Messrs. Pole and Stewart have not considered the ties as performing the whole duty of resisting the wind, but they have deducted from 20 to 25 per cent. of the total force, which they consider to be the resistance the columns would offer to an amount of bending corresponding to the lateral motion assumed. The resistance to bending is, without doubt, an element contributing to the strength, so far as it can be relied upon; but having regard to the fact that these piers were composed of seven tiers of columns connected together by bolts and nuts, and that the base plates to which they were fastened at the top of the masonry were only held down at the bases by bolts passing through two courses of stone, we think that a reduction of 20 or 25 per cent. on account of the resistance of such columns to bending is not admissible, and that, as a matter of ordinary precaution, the calculation ought not to be so treated. But as this great reduction has been made in the strength of the ties, no further deduction in the usual margin of safety (or the factor of 4) should on any account be permitted.

The minimum sectional area of the ties is stated in that report to be 1.69 in., and the total stress on the ties would therefore be—

With no train..... 5.21 x 1.69 = 8.80 tons.  
With train over pier..... 6.79 x 1.69 = 11.47 tons.

If these stresses be multiplied by 4, the usual factor of safety, the ultimate strength required in the ties would, under the assumed conditions, be—

With no train..... 8.80 x 4 = 35.2 tons.  
With train over pier..... 11.47 x 4 = 45.88 tons.

The ultimate strength given to these ties should not, therefore, have been less than 45.88 tons under the conditions assumed. But the mean ultimate strength of six of the ties tested by Mr. Kirkaldy without the lugs was only 25.6 tons,



and the mean strength of 14 tie-bars tested with the lugs was 24.1 tons, of which six broke with less than 22 tons, four of the latter giving way at unsound lugs, and two of them breaking with less than 21 tons.

The experiments were made on ties and lugs taken from the ruins, but no injury was apparent on them from that cause, and we think the weakness found in them was due to causes to which we shall now refer.

IX. The tensile strength of the wrought iron used in the ties was proved by Mr. Kirkaldy's experiments to be 20 tons to the inch, and, the minimum sectional area of the tie-bars as measured being 1.625 in., they ought to have carried 32.5 tons; but the bearing surface of the pin was much less than the minimum sectional area, and the pin being placed very near the extremity of the bar, it was not capable of developing the whole strength of the metal, which yielded by tearing or fracture at the pin hole.

Again, as regards the cast-iron lugs, the tensile strength of the metal obtained from the average of 14 specimens cut out of broken cast-iron columns was 9.1 tons per square inch, the weakest being 8.1 tons per square inch. Fourteen cast-iron lugs, to which the tie-bars were attached and which form portions of the diagonal cross-bracing between the columns, were tested in London. These tests were made by strains applied in the same direction as the lugs would be subjected to on the piers. Of these, ten were found to be sound castings, and four unsound. Of the sound castings the strongest bore less than three tons per square inch before breaking; the average, 2.8 tons per square inch, and the weakest 2.44 tons per square inch before they broke.

We believe this great apparent reduction of strength in the cast iron is attributable to the nature of the fastenings, which caused the stress to be brought on the edges or outer sides of the lugs, instead of acting fairly upon them. And we wish to direct attention specially to these results, because the employment of wrought-iron ties bolted to cast-iron lugs is a mode of construction frequently employed in other structures, and the deficiency of strength arising from it is not, we think, generally known.

As a question of ultimate strength, it may be urged that if the weakest ties bore nearly 21 tons, the viaduct ought to have been able to resist 35 lbs. per square foot of wind pressure, because, according to the calculations of Messrs. Pole and Stewart, 35 lbs. of pressure would have been required to produce that strain. But Messrs. Pole and Stewart's calculation is based on the assumption that the columns and their connecting bolts bear 20 to 25 per cent. of the wind pressure, leaving only 75 or 80 per cent. to be carried by the ties; it also assumes that all the ties are equally tightened up, that the columns are in their correct positions, and that every part or member of the pier is performing its exact proportion of duty.

These are conditions which can only exist within the elastic limit of the materials, and the elastic limit of iron in tension is somewhere about half its ultimate strength; that limit once passed, it is impossible to say what would be the relation between the strains in the different members of which the pier was composed.

Mr. Kirkaldy's experiments show that the stretching or elongation of the ties, when tested with their fastenings, was greatly in excess of that due to the elastic action of that material; a result attributable to the small bearing surfaces of the pins, gibs and cotters, and to the conical holes in the lugs.

In considering the construction of these piers, it is further to be observed that any considerable stretching of the diagonal bracing, and consequent departure of the columns from the vertical, was a derangement or distortion, which it was especially important to avoid, because such a movement could not take place without causing an unequal bearing at the bases or at the joints of the columns where it occurred, and might either result in fracture of the flanges or of the connecting bolts.

And if, from this or any other cause, one of the outer columns became fractured so as to be incapable of bearing weight, the L-shaped box-girder would have been deprived of the support necessary to sustain the main girder resting upon it. The liability to accident from this cause is a direct consequence of the peculiar construction adopted in these piers.

The hexagonal form given to the pier had also the effect of throwing the main duty of resisting wind pressure upon the cross-bracing between the inner 15-in. columns. The cross bracing on the four oblique planes formed between the 18 in. and 15 in. columns, and placed on those planes at an unfavorable vertical angle contributed proportionately much less resistance to lateral pressure.

Before leaving the subject of the cross-bracing, we think it right to point out that this part of the structure forms a comparatively small item in the quantity of metal and consequent cost of the bridge. The weight of the cross-bracing in one of the high piers was stated approximately at 5 tons, the total weight of iron in the piers being 78 tons, and it will be seen by the return of the quantities of ironwork used by the contractors, that out of a total quantity of iron of 10,518 tons, only 418 tons is classed under the head of bracing.

It would appear, therefore, that a great increase of strength might have been given to the cross-bracing, on which so much depends in resisting wind pressure, without adding a large percentage to the cost of the bridge.

The wind force required to overturn the piers as a whole, assuming that there were no holding-down bolts, is estimated by:

	With no train, lbs. per square foot.	With a train on bridge, lbs. per square foot.
Mr. Law .....	36.38	34.33
Messrs. Pole and Stewart .....	37.4	34½

In these estimates it is of course assumed that the cross-bracings and other parts are of adequate strength.

The holding-down bolts passed through two courses of stone; and if the effect of the additional weight thus brought into operation be taken into account, together with a fair allowance for the tenacity of the cement, the stability against overturning would have been sufficient to resist 40 lbs. of wind if the cross bracing had been made strong enough to resist the pressure.

An opinion has been frequently expressed that the bases of the piers were too narrow, and it is clear that the requisite stability could have been obtained more readily if the bridge had been made for a double instead of a single line of railway; but with ironwork and bracing of sufficient strength in all their parts, held down by strong bolts bedded deep in the solid mass of the piers, there is no doubt that the caissons are wide enough to permit of piers being constructed adequate to perform all the duty required.

X. There is no absolute knowledge of the mode in which the structure broke down; the evidence of persons who happened to be looking at the bridge at the time agrees in describing lights falling into the river, and that these appearances lasted only a few seconds, but the evidence is not sufficiently clear and definite to determine by it which portion of the bridge fell first.

It is observable in the ruins of the bridge that the columns have for the most part separated where they had been bolted to the base pieces; in two piers the separation has taken

place higher up the pier, one being at the first and the other at the second tier of columns.

At piers Nos. 33 and 37, which were at the disconnected ends of the girders, and the masonry is considerably disturbed, and the stonework has been partly torn up where it was fastened to the base pieces by the holding-down bolts, this effect is especially observable on the windward sides of these piers. The fracture of the cross-bracing are in almost every instance at the lugs.

XI. The storm which occurred at Dundee on the night of the 28th December was recorded on board the "Mars" training ship, lying near Newport, as being of the force of 10 to 11 of the Beaufort scale, and was especially characterized by strong gusts at intervals. The evidences of wind force in the town of Dundee were not, however, such as to point to extreme wind pressure, but from the configuration of the land the main force of the gusts would probably take the line of the river.

XII. The first indication of weakness in the bridge itself was the loosening of a number of the ties of the cross-bracing, a fact observed by the inspector, Henry Noble, in October, 1878. He did not communicate this fact to Sir T. Bouch, but procured iron and packed the gibs and cotters, using for this purpose more than 100 iron packings, about ¼ to ½ of an inch thick, in different parts of the bridge.

All the evidence relative to the condition of the ties states that they were, to all appearance, in proper order at the date of the inspection by Gen. Hutchinson, on the 25th, 26th and 27th of February, 1878. The loosening which subsequently ensued must have resulted from lateral action, and was most probably due, as Sir T. Bouch suggested, to strains on the cross-bracing produced by storms of wind.

Sir Thomas Bouch considers that the loosening arose from the bending of the pins in the holes which had been left conical in casting the lugs, and it was, we think, one of the causes; but the small bearing surfaces between the gibs and cotters, and the tie-bars, only about 0.375 of a square inch, would tend to increase this effect, and it might have been further increased by displacement or movement at the ends of those struts where the fitting was imperfect.

Again, in October, 1879, four of the columns were ascertained by Mr. Noble to be cracked with vertical cracks, two of them being in the northern part of the bridge still standing, and one in pier No. 38 under the high girders. The inspector (Noble) bound these columns around with wrought-iron bands, and communicated this fact to Sir Thomas Bouch, who came to the work, and in reference to other indications of straining pointed out by the inspector, decided to have extra bracings made for the curved part of the bridge north of the large girders. It has already been mentioned that the columns of the whole bridge were filled after their erection with Portland cement concrete, put in from the top, and concrete of this material, unless carefully managed, is liable to swell in setting; from this circumstance, and from the unequal contraction of cast iron and concrete by cold, internal strains might have arisen sufficient to produce such cracks. Cracks of a like character have occurred in other viaducts; and when the fracture is vertical, it is capable of remedy, to a considerable extent, by hooping with wrought-iron bands.

In this state of the columns and ties the storm of the 28th December, 1879, occurred, which would necessarily produce great tension on the ties, varying as the heavy gusts bore upon different parts of the bridge; and when under these strains the train came on the viaduct, bringing a larger surface of wind pressure to bear, as well as increased weight on the piers, and accompanied by the jarring action due to its motion along the rails, the final catastrophe occurred.

The distance at which the girders were found from the piers, and the position of the wreckage on the piers, is such as would result from a fracture and separation taking place in the piers somewhere above the base of the columns; and such a fracture might have arisen from two causes: firstly, by the yielding of the cross-bracing, and the consequent distortion of the form of the piers, which would throw unequal strains on the flanges and connecting bolts; or secondly, fracture might have taken place in one of the outer leeward columns from causes similar to those which produced the fractures found in other columns shortly before the accident.

XIII. Sir T. Bouch states it to be his opinion that the accident was occasioned by the overturning of the second-class carriage and the van behind it by the force of the wind, that they were canted over against the girder, and that the force of the blow given by these vehicles at the speed at which they were traveling was sufficient to destroy portions of the girders, and so occasioned the fall. But in this opinion we do not concur, and do not consider that it is supported by the evidence of the engineers who were called on by the part of the railway company, Sir T. Bouch, and the contractors.

Dr. Pole, Mr. Stewart and Mr. Baker, all of whom were called on behalf of Sir T. Bouch, although they suggest the possibility of some shock acting in addition to the wind pressure, all concur in attributing the first failure to the lugs of the cross-bracing. Mr. Cochrane believes that if the columns had been strongly braced, strongly fitted, and strongly held down by holding-down bolts, the pier would have been standing now, and adds "it is a question of cross-bracing, of course." Mr. Law also considers that the structure yielded because the ties were inadequate.

Such being the nature of the case brought under our consideration in this inquiry, we have to state as our opinion—1st. That there is nothing to indicate any movement or settlement as having taken place in the foundations of the piers which fell.

2d. That the wrought iron employed was of fair strength, though not of high quality as regard toughness.

3d. That the cast iron was also fairly good in strength, but sluggish when melted, and presented difficulty in obtaining sound castings.

4th. That the girders which had fallen were of sufficient strength, and had been carefully studied in proportioning the several parts to the duty they had to perform; in these girders some imperfections of workmanship were found, but they were not of a character which contributed to the accident, and the fractures found in these girders were, we think, all caused by the fall from the tops of the piers.

5th. That the iron piers used in the place of the brick piers originally contemplated were strong enough for supporting the vertical weight, but were not of a sufficiently substantial character to sustain, at so great a height, girders of such magnitude as those which fell. That the cross-bracing and its fastenings were too weak to resist the lateral action of heavy gales of wind.

6th. That the workmanship and fitting of the several parts comprising the piers were inferior in many respects.

7th. That although a large staff of assistants and inspectors was employed, we consider that a sufficiently strict supervision was not exercised during the construction of that part of the work made at the Wornit foundry. We think that the great inequality of thickness in some of the columns, the conical holes cast in the lugs, and several imperfections of workmanship which have been ascertained by this inquiry, ought to have been prevented.

8th. That the arrangements for the supervision of the bridge after its completion were not satisfactory, inasmuch as it was entrusted solely to Henry Noble, who, although an

intelligent man and very competent in the class of work to which he had been accustomed, possessed no experience in structures of iron-work, nor does it appear that he received any definite instruction to report as to the state of the iron-work of the bridge.

9th. That Henry Noble, having become aware that many of the ties of the cross-bracing were loosened in October, 1878, ought at once to have informed Sir T. Bouch of this circumstance. Had he done so, there would have been ample time to have put in stronger ties and fastenings before the occurrence of the storm which overthrew the bridge.

10th. That the ties of the cross-bracing had been tightened up and brought to their bearing before the date of the inspection by General Hutchinson, and the fact that many of them became loose so soon afterward was an evidence of weakness in this part of the structure, and of a departure from the proper inclination or batter of the columns where it occurred; and we think that the loosening of the ties to an extent sufficient to permit the insertion of pieces of iron ¼ or ½ of an inch thick indicated a considerable change of form of the pier, and rendered it doubtful if the piers could have recovered their form when the wind action ceased. The employment of packing-pieces under such circumstances might have had the effect of fixing the parts of the structure where they were applied in their distorted form.

11th. That notwithstanding the recommendation of General Hutchinson that the speed of the trains on the bridge should be restricted to twenty-five miles per hour, the railway company did not enforce that recommendation, and much higher speeds were frequently run on portions of the bridge.

12th. That the fall of the bridge was occasioned by the insufficiency of the cross-bracing and its fastenings to sustain the force of the gale on the night of Dec. 28, 1879, and that the bridge had been previously strained by other gales.

13th. That although the general bearing of the evidence indicates the cross-bracing as being the first part to yield, yet it is possible that the fall of the bridge may have been occasioned by a fracture, or partial fracture, in one of the outward leeward columns, produced by causes analogous to those which fractured other columns shortly before the accident; for if a fracture, or partial fracture, of a dangerous character occurred in one of these columns, the extra strain brought on by the force of the gale, accompanied by the weight and tremor of the train, might have led to its final rupture.

14th. That the first or southern set of continuous girders, covering five spans, was the first that fell after the engine and part of the train had passed over the fourth pier, and that the two consecutive sets of continuous girders, each covering four spans, were in succession pulled off the piers, on which their northern ends rested, by the action of the first set of continuous girders falling over, and probably breaking some of the supporting columns.

15th. That the extent of the work which fell must be attributed to the employment of long continuous girders, supported by piers built up of a series of cast-iron columns of the dimensions used.

In conclusion, we have to state that there is no requirement issued by the Board of Trade respecting wind pressure, and there does not appear to be any understood rule in the engineering profession regarding wind pressure in railway structures; and we therefore recommend that the Board of Trade should take such steps as may be necessary for the establishment of rules for that purpose.

We also recommend, before any steps are taken for the reconstruction of the Tay Bridge, that a careful examination should be made of those parts of the structure left standing, especially as regards the piers, with a view to ensuring such alterations and amendments as may be necessary to give to these portions of the work complete stability.

W. YOLLAND,  
W. H. BARKLOW.

#### REPORT OF MR. ROTHERY.

The following are extracts from this report, which is very voluminous:

#### Preliminary Remarks.

(1.) For reasons, into which it is not necessary to enter, I have thought it better to send in my own separate report, instead of joining in a report with my colleagues.

(2.) The two reports will be found to agree substantially in their conclusions. A statement of the points, on which we agree, and on which we do not agree, will be found at the end of this report.

(3.) Although this report is only signed by myself, I have retained the plural number throughout, as it would require some time to make the necessary corrections, and no misconception is likely to arise therefrom.

#### Responsibility for the Accident

The conclusion, then, to which we have come is that this bridge was badly designed, badly constructed, and badly maintained, and that its downfall was due to inherent defects in the structure, which must sooner or later have brought it down.

For these defects both in the design, the construction, and the maintenance, Sir Thomas Bouch is, in our opinion, mainly to blame. For the faults of the design he is entirely responsible. For those of construction he is principally to blame in not having exercised that supervision over the work which would have enabled him to detect and apply a remedy to them. And for the faults of maintenance he is also principally, if not entirely, to blame in having neglected to maintain such an inspection over the structure as its character imperatively demanded.

It is said that Sir Thomas Bouch must be judged by the state of our knowledge of wind pressures when he designed and built the bridge. Be it so; yet he knew or might have known that at that time the engineers in France made an allowance of 55 lbs. per square foot for wind pressure, and in the United States an allowance of 50 lbs. And although there seems to have been no agreement amongst English engineers as to the allowance proper to be made, Mr. Brunles told us that he allowed 30 lbs., and even Mr. Baker allowed 28 lbs. Sir Thomas Bouch was building a bridge on somewhat new principles, and in a position where it would be peculiarly exposed to the action of westerly and south-westerly gales; and not only does he make no allowance for wind pressure, but actually builds the bridge weaker and lighter and with wider spans than in his previous works. To have built and designed a bridge which, if properly constructed in all respects, would only have borne a lateral pressure of from 60 lbs. to 70 lbs. per square foot, when a pressure of 40 lbs. to 50 lbs. of wind was quite possible, was a grave error of judgment. Whether, too, the calculation of its stability, or the maximum pressure of the wind, be or be not erroneous matters very little; the bridge fell in a gale of wind, which, though violent, was not one which could not, and ought not, to have been provided against. It fell solely by the action of the wind; either then the margin of safety was too low or the defects too great. In neither way can Sir Thomas Bouch escape his responsibility.

We think also that Messrs. Hopkins, Gilkes & Co. are not free from blame for having allowed such grave irregularities to go on at the Wornit foundry. Had competent persons been appointed to superintend the work there, instead of its being left almost wholly in the hands of the foreman



moulder, there can be little doubt that the columns would not have been sent out to the bridge with the serious defects which have been pointed out. They would also have taken care to see that the bolt holes in the lugs and flanges of the 18 in. columns were cast truly cylindrical, or, if that could not be done they would have called the attention of the engineer or his assistants to the fact, but that does not appear to have been done. The great object seems to have been to get through the work with as little delay as possible, without seeing whether it was properly and carefully executed or not.

The company also are, in our opinion, not wholly free from blame for having allowed the trains to run through the high girders at a speed greatly in excess of that which General Hutchinson has suggested as the extreme limit. They must or ought to have known from the advertised time of running the trains that the speed over the summit was more than at the rate of 25 miles an hour, and they should not have allowed it until they had satisfied themselves, which they seem to have taken no trouble to do, that speed could be maintained without injury to the structure.

It remains to inquire whether the Board of Trade are also to blame for having allowed the bridge to be opened for passenger traffic as and when they did. Let us see, then, what are the duties which the Legislature imposes upon the Board of Trade in connection with the opening of new lines of railway, and how those duties were performed in this case. By the Act 5 and 6 Vict. c. 55, s. 4, it is enacted that no new line of railway shall be opened for passenger traffic until one month after notice of the company's intention to open it has been sent to the Board of Trade, and until 10 days after notice has been sent that it is complete and ready for inspection. No plans or drawings of the structure are required to be sent before the service of the notices, and as a fact we are told that they are seldom sent before the 10 days' notice is served, and frequently not until afterward. One of the inspecting officers of the Board of Trade has then to examine the plans and details, to inspect the railway, and to make his report; and if a copy of his report and an order to postpone the opening are not sent to the railway authorities before the expiration of the 10 days' notice, the company may open the line for passenger traffic without the sanction of the Board of Trade, whatever may be its then state and condition. Seeing, too, that the inspecting officers may, when the notice reaches them, have other work on their hands, it is obvious that the examination and inspection can be little more than superficial. It seems that on the receipt of the usual notices from the North British Railway Company of their intention to open the Tay Bridge for passenger traffic, Major-General Hutchinson, one of the railway inspectors for the Board of Trade was instructed to inspect the bridge. The inspection took place, as we have stated, on the 25th, 26th and 27th of February, 1878, and on that occasion the company placed at General Hutchinson's disposal, for the purpose of testing the bridge, six new goods engines, each of which weighed 73 tons, and measured 48½ ft. over all, and as the total weight of the six engines was thus 438 tons, and the total length 291 ft. this gave a pressure of rather more than 1½ tons to every running foot, which is considered a very severe test. These engines were run singly and together over the bridge at various speeds up to 40 miles an hour, and the extent of the deflection and of lateral oscillation having been carefully noted, the results, to use General Hutchinson's words, were considered satisfactory, the bridge having been found to be stiffer than he had anticipated. Accordingly on the 5th of March following he reported that he saw "no reason why the Board of Trade should object to the railway on the Tay Bridge being used for passenger traffic."

In giving his evidence before us General Hutchinson was asked (Q. 15,967) whether his examination of the bridge on that occasion had been sufficient to enable him to make his report, and he answered, "It was. I observed no symptoms of weakness, which in my judgment gave any reason to doubt the stability of the structure, of course always presupposing that the materials of which it was constructed were good, that the workmanship was good, and that it was properly maintained." Mr. Bidder, not being satisfied with this answer, and anxious to obtain a stronger expression of opinion from him on the subject, asked him (Q. 15,989), "I think I gather that in your judgment, assuming it to be properly constructed and the workmanship to be good, the design was satisfactory?" but General Hutchinson answered, "I would rather put it in this way: that the design was not unsatisfactory; there was nothing in the design in my judgment to warrant me in objecting in any way to it. Of course no one can say that a broader base would not be a desirable thing." General Hutchinson declined to pledge himself to a general approval of the design. All that he would say was that he could see nothing in it which would justify him in taking the very strong measure of withholding a certificate. So also with respect to the materials and the workmanship, he declined to say whether they were good, nor was it possible for him to do otherwise, seeing that the whole of the work was finished, and the defects, if any, covered up when General Hutchinson made his inspection. He admitted very fairly that his inspection had been only a superficial one, and that he could judge of the work only from its appearance externally. It is important to bear this in mind, for there seems to be an impression abroad that after a work has been inspected and passed by the officers of the Board of Trade the engineer and others by whom it has been constructed are relieved from responsibility for any defects which may subsequently be discovered, but this can hardly be so. If the inspecting officers are to be held responsible for all defects both of design and of construction not only should the plans be submitted to them for their approval before the work is commenced, but they ought during its progress to be allowed to exercise the same amount of supervision as the engineer and his assistants are supposed to do. Whether the country would be prepared to sanction any such interference with private enterprise, with the view of relieving those who are and ought to be primarily responsible for the work, may well be doubted; but, however this may be, the Legislature has not done so. All that the law requires is that the officers of the Board of Trade shall say not whether the design is good and the work constructed on the best principles, nor whether there are or are not any latent defects in it, but whether they can give any good reason why it should not be opened for passenger traffic. One point, however, deserves to be noted in connection with General Hutchinson's inspection, and it is this, that although he seems to have tested the bridge sufficiently, indeed severely, for a vertical dead weight pressure, he made no allowance of any kind for wind pressure, it not being, he said, the practice to do so. It may be well to quote what he says on this subject: 16,070. (The Commissioner). Did you make any calculations at all when these plans were given to you as to what force of wind would be sufficient to overturn the bridge?—No, I did not. I made no calculations as regards the wind.

16,071. How did you judge then of the stability of the bridge, if you made no calculations?—As I have already stated, the subject of wind pressure never entered into the calculations that I made, and never had done, I believe in, I will not say, civil engineers' calculations, but as far as I know, it has never been taken into account.

16,072. Do you know whether it is so in America or France?—I cannot say. I believe that in France they have some rules,

but it has never been hitherto customary in this country, as far as I am aware, to consider this question, especially in an open structure like this. Had the girders been plate girders, it would, of course, have struck one naturally that one ought to take very great care about the wind.

Further on he said, in answer to a question put by Mr. Barlow:

16,084. With regard to the width of base, if everything was made strong and good, with proper holding-down bolts, and with very sufficient wind-ties, do you think that width of base insufficient?—No, I think not insufficient, if everything was thoroughly good and made as solid and substantial as possible. There would be, I should imagine, quite 60 lbs. or 70 lbs. of stability against lateral pressure, supposing these piers were as one, and the holding-down bolts good. I have not made the calculation with regard to the holding-down bolts; I have made it with regard to the piers standing on their legs, and I make it something over 40 lbs., without taking in the holding-down bolts.

When Gen. Hutchinson gave his answer that he considered that 60 lbs. or 70 lbs. of stability would not be insufficient, he could hardly have known that a wind pressure of 40 lbs. and even 50 lbs. was quite possible, which would leave a margin of stability of only about half. After what has come out in the course of this inquiry, it is clear that there can be no justification in future for disregarding altogether, as seems to have been done, the effect of the wind pressure on such a structure as this; but whether Gen. Hutchinson is or is not to blame for having so done, Sir Thomas Bouch is not relieved from his responsibility.

#### Standing Portion of the Bridge.

It remains for us to say a few words in regard to the portion of the bridge which is still standing, and on which we have had a report from Mr. Law, which will be found in the appendix.

Mr. Law, after calling attention to the bed of the river, which he states still shows a tendency to scour, and will therefore require to be carefully watched, observes that on piers 15 to 27 to the south of the high girders, and piers 42 to 48 to the north thereof, the weight of the superstructure is wholly borne "by four 16 in. columns, which are bolted to a foundation stone, and are surmounted by a square wrought-iron box girder or entablature, which supports the superstructure;" in addition to which there are two outer columns, one on each side, which are carried up vertically to the last tier, and then rake inward at a very sharp angle to form raking struts to the wrought-iron box girder. But, as Mr. Law observes, "it is evident that in their present condition these external columns are of very little service in strengthening the structure" (and he would add in resisting wind pressure): first, because of the very unfavorable angle of the wrought-iron ties, which connect them with the 16-in. columns, and, secondly, because they have no direct tie at the upper part of the perpendicular columns to resist the thrust of the raking columns. He also calls attention to a number of other piers on the north side of the bridge, where there are but three columns, two vertical and one raking, "upon which the lattice girders of the superstructure merely rest without any attachment." These three columns were, he says, "intended to be," and ought to be, "in one plane;" but they are not always so. The lengths, too, of the lattice girders not corresponding to the distances between the centres of the piers, the joints of the girders are not vertically over the centres of the piers, deviating in some instances to the extent of 18 in. The result is, there being "no kind of stay to prevent the movement of the head of the column in the direction of the length of the bridge, and no kind of attachment between the girder and the columns," that there is very great risk of the girder, which here merely rests on the tops of the columns, slipping off.

#### Conclusion.

These are some of the defects in the standing portion of the structure, to which it is necessary that attention should be directed, in the event of its being determined to restore the bridge. That it will be rebuilt there can be no doubt, for the interests of the large and thriving town of Dundee imperatively demand it. If, however, it should be rebuilt with its narrow base, its cast-iron lugs, its conical bolt-holes, its unconnected L girders, and with the other numerous defects which we have pointed out, and without adequate allowance being made for wind pressure, a very serious responsibility will rest on all concerned, and one which the country would not very readily pardon.

#### The Two Reports Compared.

I stated in the commencement of this report that there was practically an entire agreement between my colleagues and myself in the conclusions at which we had arrived; and that almost the only difference between us was, whether some facts, which had come out in the course of the inquiry, ought or ought not to be referred to more at length.

The points on which we are agreed are as follows: I agree with them in thinking that there is no evidence to show:

- (1.) That there has been any movement or settlement in the foundations of the piers.
- (2.) That the wrought-iron was of fair quality.
- (3.) That the cast-iron was also fairly good, though sluggish in melting.
- (4.) That the girders were fairly proportioned to the work they had to do.
- (5.) That the iron columns, though sufficient to support the vertical work of the girders and trains, were, owing to the weakness of the cross-bracing and its fastenings, unfit to resist the lateral pressure of the wind.
- (6.) That the imperfections in the work turned out at the Wormit foundry were due in great part to a want of proper supervision.
- (7.) That the supervision of the bridge after its completion was unsatisfactory.
- (8.) That, if by the loosening of the tie-bars the columns got out of shape, the mere introduction of packing pieces between the gibs and cotters would not bring them back to their positions.
- (9.) That trains were frequently run through the high girders at much higher speeds than at the rate of 25 miles an hour.
- (10.) That the fall of the bridge was probably due to the giving way of the cross-bracing and its fastenings.
- (11.) That the imperfections in the columns might also have contributed to the same result.

These are the points, neither few nor unimportant, on which I concur with my colleagues. The points on which we are not agreed are, as to whether some facts which have come out in the course of the inquiry ought or ought not to be mentioned. The following are some of the facts to which I refer:

In the first place, I think that the error in the borings ought not to be passed over in silence. It is said that engineers are always liable to be deceived by the borers, and that, therefore, Sir Thomas Bouch could not be held to blame on that account. But that argument does not satisfy me. I should have thought that, if engineers are liable to be deceived by borers, it is all the more important that, before designing a bridge, they should satisfy themselves, beyond a doubt, of the accuracy of the borings, and which there would

have been no difficulty in doing in the present case. It is also said that, as no movement or settlement was found after the accident to have occurred in the foundations, the error in the borings was not important. But that also does not satisfy me; for it is clear that the error in the borings led to the alteration of the piers from brickwork to iron columns, and that that undoubtedly was the cause of the casualty.

Secondly, I think that we are bound, in justice to those most deeply interested in this case, carefully to consider all the various suggestions which they have put forward to account for the fall of the bridge; and it, therefore, seemed to me that it would not be fair to them or satisfactory to you, that we should simply give it as our opinion that the train had not struck the girder, without stating at length the grounds on which that opinion was formed.

I think also that it is not sufficient to say that the supervision at the Wormit foundry, and in the subsequent maintenance of the bridge, was insufficient, without saying in what that insufficiency consisted, and who was to blame for it. I think also that it was our duty to call attention to certain defects in the design which rendered the structure weak, and thereby contributed to its fall; for instance, to the narrow base, the slight inclination of the outer columns, and the omission of the spigots at their bases, and to the casting of the holes in the lugs and in the flanges of the 18-in. columns. I thought also that these defects could best be shown by comparing the work on the Tay Bridge with that done by the same engineer on the Beulah Viaduct.

It seemed to me also that we ought not to shrink from the duty, however painful it might be, of saying with whom the responsibility for this casualty rests. My colleagues thought that this was not one of the questions that had been referred to us, and that our duty was simply to report the cause of, and the circumstances attending, the casualty. But I do not so read our instructions. I apprehend that, if we think that blame attaches to any one for this casualty, it is our duty to say so, and to say to whom it applies. I do not understand my colleagues to differ from me in thinking that the chief blame for this casualty rests with Sir Thomas Bouch, but they consider that it is not for us to say so.

Lastly, my colleagues in their report call attention to the fact "that there is no requirement issued by the Board of Trade respecting wind pressure, and that there does not appear to be any understood rule in the engineering profession regarding wind pressure in railway structures;" and they therefore "recommend that the Board of Trade should take such steps as may be necessary for the establishment of rules for that purpose." I cannot, however, join in that recommendation; for it appears to me that, if there is no "understood rule in the engineering profession regarding wind pressure in railway structures," it is for the engineering profession, and not for the Board of Trade, to make them. I will add that, if I rightly understood my colleagues at our last interview, they concurred in the conclusions to which I had come, that there might be a maximum wind pressure of from 40 lbs. to 50 lbs. per square foot, and this too not only over a few feet, but over the whole extent of a span of one of the high girders, and I gather as much from their report. And if so, seeing that it is the practice in France to allow 55 lbs. per square foot for wind pressure, and in the United States 50 lbs., there seems to be no reason why a similar allowance should not be made in this country.

I will only add, in conclusion, that I should hardly have ventured, in a case of so much difficulty and importance, to have made on my own responsibility the remarks I have done, had I not felt that they are fully borne out by the evidence that has been laid before us; and that, although my colleagues have not thought fit to join in this report, they do not differ, except, perhaps, on some very minor points, from the conclusions at which I have arrived. I have the honor to be, sir, your most obedient, humble servant,

H. C. ROTHERY.

#### Southwestern Railway Association.

An adjourned special meeting of this Association was held in Chicago, July 12, at Commissioner Midgley's office. There were present Messrs. J. C. McMullin, Chicago & Alton; T. J. Potter and E. P. Ripley, Chicago, Burlington & Quincy; R. R. Cable and J. T. Sanford, Chicago, Rock Island & Pacific; J. B. Carson and W. H. McDole, Hannibal & St. Joseph; A. A. Talmadge and J. A. Hall, Missouri Pacific; John C. Gault and A. C. Bird, Wabash, St. Louis & Pacific; and Commissioner Midgley. Mr. R. R. Cable presided.

The meeting lasted all day, but no important action was taken. The matter of percentages was only indirectly referred to, several roads signifying their readiness to arbitrate.

Commissioner Midgley was instructed to communicate with all roads west of Pittsburgh and Buffalo and east of Chicago for the purpose of calling a convention to induce all lines in interest to weigh all car-load freight and charge actual rates.

Sheep pelts were classified as wool, and copper ore as bullion.

The meeting then adjourned until next day.

The second day's session was devoted to a consideration of the question of percentages to be allowed the various lines, on account of the dissatisfaction shown by the Chicago, Rock Island & Pacific. The latter line was willing to agree upon new figures or percentages at once. All the roads were willing to agree to this mode of settlement with the exception of the Chicago, Burlington & Quincy, who wanted the matter settled by arbitration, as they believe their award would be greater if settled in the latter way. The Chicago & Alton was anxious to have the difficulty settled either way, and offered some compromising resolutions, which again did not suit all parties. Mr. Gault, of the Wabash, St. Louis & Pacific, stated that he would not enter the Iowa pool until this matter was settled. Finally a resolution was adopted whereby the meeting adjourned, without action, subject to the call of Commissioner Midgley, it being understood that the meeting will not be called until some time in September, when the Wabash, St. Louis & Pacific road will be ready to carry freight to Chicago direct.

#### Railroads of the United States in 1879.

[Advance sheets of the introduction to Poor's "Manual of the Railroads of the United States for 1880-81."]

The thirteenth annual number of the Manual of Railroads of the United States herewith presented records the largest earnings ever received by our railroad companies as well as the largest annual increase in miles of road built since 1873. The details in regard to cost, earnings, etc., will be found in the tables that follow. It will be noticed that the Manual has been more than usually successful in obtaining returns from railroad companies, the operation reported including 84,232 miles out of a total of 86,472 miles. The usefulness of publicity which we have always urged, seems at least to be generally recognized by railroad companies, and they as well as the public whose money is invested in their securities are the gainers.

As was noted in the Manual for 1879, the most marked feature in connection with the increase of earnings, continues to be the reduction in freight charges which have been



taking place on all our leading railroads for several years, and in no year more notably than in that which has just closed. Only an extraordinary increase in tonnage moved would enable the railroads to continue such reductions, of which the public reap by far the largest reward. To show the changes that have been made in these respects during the last seven years, we have compiled the following table, commencing with the year 1873, that of the greatest prosperity in railroads prior to 1879:

Table showing Amount of Freight moved, Earnings from Freight, and Rate of Charge per ton per mile on the Railroads named in the Years 1873 and 1879:

LINE OF ROAD.	Tons of freight moved.		Receipts from freight.	
	1873.	1879.	1873.	1879.
Boston & Albany.....	2,884,520	2,738,096	\$6,221,184	\$3,588,839
N. Y. C. & H. R.....	5,512,124	9,015,753	19,616,018	18,270,250
N. Y. L. E. & W.....	6,312,702	8,212,611	15,015,808	12,233,481
Pennsylvania.....	9,211,234	13,684,041	19,608,555	17,017,089
P. F. W. & C.....	2,316,568	3,670,382	6,716,399	6,060,563
L. S. & M. S.....	5,176,061	7,541,204	14,192,399	11,288,261
Mich. Central.....	2,186,786	3,513,810	4,318,002	4,980,985
Ch. & Alton.....	1,642,443	2,634,177	3,807,462	4,242,791
C. & B. & Q.....	2,231,744	4,686,520	8,035,349	11,659,623
C. & M. & St. P.....	1,791,504	2,559,734	6,421,760	6,850,755
C. & N. W.....	2,958,390	4,265,937	8,614,260	9,924,030
C. R. I. & P.....	1,286,966	2,236,670	4,597,982	6,929,926
Ill. Central.....	2,057,300	2,324,485	4,148,901	3,262,526
	45,557,002	67,092,549	\$112,094,648	\$116,311,452

LINE OF ROAD.	Rate per ton per mile (cts.)		Miles of railroad.	
	1873.	1879.	1873.	1879.
Boston & Albany.....	1.96	1.10	293	322
N. Y. C. & H. R.....	1.57	0.81	858	1,018
N. Y. L. E. & W.....	1.45	0.78	950	928
Pennsylvania.....	1.41	0.79	809	1,032
P. F. W. & C.....	1.41	0.76	468	468
L. S. & M. S.....	1.33	0.64	1,154	1,177
Mich. Central.....	1.22	0.69	801	804
Ch. & Alton.....	2.12	1.05	649	787
C. & B. & Q.....	1.92	1.01	1,236	1,783
C. & M. & St. P.....	2.49	1.72	1,390	1,906
C. & N. W.....	2.35	1.56	1,382	1,616
C. R. I. & P.....	2.29	1.43	674	1,125
Ill. Central.....	1.51	0.97	705	705
Average.....	1.77	1.02	11,438	13,821

It is to be regretted that the reports of the Baltimore & Ohio Railroad are not so kept as to enable us to make a comparison of all the trunk lines.

It will be seen by the above that while there has been an increase in freight moved of 47.27 per cent., and in miles of road operated of 20.83 per cent., the increase in earnings from that source has been only 3.84 per cent. Freight is now moved at a rate per ton per mile which would five years ago have been regarded as impossible. The percentage of decrease has been 42.31 per cent.—nearly equal to the increase in tons of freight moved. Fortunately for the country, there has been during the past year an unusual freedom from adverse legislation tending to regulate the operations of our railroads, and as a consequence the companies have been left free to work out the problem of cheap transportation, governed only by the inevitable laws of trade. The reduction in rates during the year just closed is, therefore, greater than in any one year before, except among a few of the trunk lines during what is known as the war of rates in 1875-76.

The rates per ton per mile for 1878 and 1879 were as follows:

	1878.	1879.	Decrease.
B. & A.....	1.13	1.10	.03
N. Y. C. & H. R.....	0.93	0.81	.12
N. Y. L. E. & W.....	0.97	0.78	.19
Penna.....	0.92	0.79	.13
P. F. W. & C.....	0.88	0.76	.12
L. S. & M. S.....	0.73	0.64	.09
Michigan Central.....	0.85	0.69	.16
C. & A.....	1.30	1.05	.25
C. & B. & Q.....	1.02	1.02	..
C. & M. & St. P.....	1.80	1.72	.08
C. & N. W.....	1.73	1.56	.17
C. R. I. & P.....	1.56	1.43	.13
Ill. Central.....	1.03	0.97	.06
Average.....	1.15	1.02	.13

The freight earnings of the roads given in the above table were in 1873 about one-third of those of all the railroads in the United States, and in 1879 about one-fourth. Had the rates of 1873 been maintained in 1879, the receipts for the latter year, instead of being as now, would have reached on the roads named the sum of \$230,618,839, and for the United States, \$922,475,352. The difference between the amount actually received and that given above shows what has been gained by the public in the operations of our railroads alone. In no other branch of commerce can anything like this saving be shown. It is the result of intelligence, skill and ingenuity, left free to work out the best possible results, unhampered by other legislation than that of their own officers, composing a legislature in constant session.

Another significant fact shown by the tables is the reduction in both the funded and floating debts as compared with last year. This has come about through the process of reorganization of bankrupt companies now nearly completed, and the transfer of those forms of indebtedness to capital stock. While the funded debt has decreased \$15,251,851, and the floating debt, \$25,367,504, the capital stock shows an increase of \$187,708,068. The amount of interest paid has increased \$9,077,006, notwithstanding the reduction of the debt; the rate of interest paid on the funded debt averages 4.91 per cent., an increase of 0.27 per cent. as compared with 1878. The average rate of dividend paid was 2.49 per cent. as compared with 2.34 per cent. for 1878, a gain of 0.15 per cent. The increase in amount paid as dividends was \$8,052,152. Thus, while the gross earnings show an increase compared with 1878 of \$38,909,648, and the net earnings of \$32,341,557 the amount paid for interest and dividends has increased \$17,129,106. The remainder has gone into permanent improvements, reserve funds, and other forms of security.

A notable feature, also, is the great number of consolidations that have taken place during the year, bringing long lines of road under a single management. In 1869 there

Table showing the Mileage, Gross and Net Earnings, Freight and Passenger Earnings, and Dividends of the Railroads of the United States for seven years, 1873-1879, arranged by geographical divisions:

	1870.	1878.	1877.	1876.
<b>NEW ENGLAND.</b>				
Miles of railroad.....	6,156	5,700	6,036	5,783
Earn. from pas- sengers.....	17,522,682	17,967,766	20,065,700	20,516,215
Earnings from freight, etc.....	23,807,143	23,292,437	24,524,756	25,244,778
Earnings from all sources.....	41,329,825	41,260,203	44,590,456	45,760,993
Net earnings.....	15,586,091	13,685,927	13,735,746	15,379,072
Dividends.....	7,236,205	7,506,055	6,977,726	7,607,973
<b>MIDDLE STATES.</b>				
Miles of railroad.....	14,941	14,600	13,007	13,647
Earn. from pas- sengers.....	43,195,638	35,953,207	39,255,780	47,483,865
Earnings from freight, etc.....	127,115,208	119,505,761	116,687,341	130,129,542
Earnings from all sources.....	170,310,846	155,458,968	155,943,121	177,613,407
Net earnings.....	70,416,970	61,559,993	61,033,089	69,382,517
Dividends.....	23,911,164	21,148,442	24,800,480	33,090,411
<b>SOUTH &amp; SOUTHWEST.</b>				
Miles of Railroad.....	13,386	12,498	11,272	13,948
Earn. from pas- sengers.....	11,321,478	11,221,044	9,953,000	11,877,901
Earnings from freight, etc.....	32,595,806	31,570,270	29,850,268	38,865,747
Earnings from all sources.....	43,917,284	42,791,284	39,812,358	50,743,648
Net earnings.....	14,673,357	14,379,958	12,064,346	17,119,031
Dividends.....	2,131,779	2,805,790	2,740,793	1,800,351
<b>WESTERN AND S. W. STATES.</b>				
Miles of railroad.....	41,104	41,605	39,136	36,753
Earn. from pas- sengers.....	54,448,711	48,965,480	41,437,039	43,362,211
Earnings from freight, etc.....	177,930,875	160,856,705	148,767,477	142,880,021
Earnings from all sources.....	232,379,586	209,822,185	190,204,516	186,242,232
Net earnings.....	98,961,906	77,958,229	66,085,243	63,912,968
Dividends.....	23,561,262	19,341,222	14,556,462	17,304,532
<b>PACIFIC STATES.</b>				
Miles of railroad.....	2,371	2,064	1,896	1,126
Earn. from pas- sengers.....	2,104,501	2,330,079	1,727,911	1,727,911
Earnings from freight, etc.....	7,997,990	5,406,845	4,136,405	4,136,405
Earnings from all sources.....	10,721,157	10,082,491	7,706,922	5,864,316
Net earnings.....	6,009,390	3,501,625	2,655,137	2,331,325
Dividends.....	584,104	930,000	240,000	187,701
<b>PACIFIC RAILROAD'S.</b>				
Miles of railroad.....	3,272	2,256	2,251	2,251
Earn. from pas- sengers.....	8,127,165	8,435,322	9,163,927	10,216,424
Earnings from freight, etc.....	22,227,070	22,216,808	20,006,455	20,817,379
Earnings from all sources.....	30,354,240	30,652,130	32,170,382	31,033,803
Net earnings.....	13,672,020	16,489,425	15,053,572	17,033,517
Dividends.....	3,832,965	1,837,250	7,281,640	7,299,000

	1875.	1874.	1873.
<b>NEW ENGLAND.</b>			
Miles of railroad.....	5,732	5,617	5,303
Earn. from pas- sengers.....	21,776,803	22,111,787	22,358,645
Earnings from freight, etc.....	26,552,029	27,952,987	29,310,043
Earnings from all sources.....	48,328,832	50,064,774	51,670,688
Net earnings.....	15,324,654	16,713,183	15,061,777
Dividends.....	8,788,040	8,511,971	9,004,488
<b>MIDDLE STATES.</b>			
Miles of railroad.....	13,173	12,874	12,441
Earn. from pas- sengers.....	40,772,967	41,699,871	42,355,230
Earnings from freight, etc.....	134,904,451	144,798,567	151,697,072
Earnings from all sources.....	175,677,418	186,498,438	194,052,302
Net earnings.....	65,669,418	60,188,972	60,280,595
Dividends.....	39,357,196	37,600,154	36,531,343
<b>SOUTH &amp; SOUTHWEST.</b>			
Miles of railroad.....	13,522	13,505	13,908
Earn. from pas- sengers.....	13,861,915	14,131,291	15,310,980
Earnings from freight, etc.....	36,534,312	38,127,950	38,385,420
Earnings from all sources.....	50,396,227	52,259,241	53,696,400
Net earnings.....	16,741,090	17,208,332	18,133,340
Dividends.....	1,490,906	1,068,455	901,396
<b>WESTERN AND S. W. STATES.</b>			
Miles of railroad.....	36,058	35,139	32,973
Earn. from pas- sengers.....	54,963,084	56,783,466	51,620,779
Earnings from freight, etc.....	151,224,570	158,086,011	160,097,062
Earnings from all sources.....	206,217,654	214,869,477	211,717,781
Net earnings.....	75,604,104	75,546,695	72,464,212
Dividends.....	19,230,511	16,605,832	19,055,247
<b>PACIFIC STATES.</b>			
Miles of railroad.....	1,023	417	390
Earn. from pas- sengers.....	1,843,207	1,223,248	1,175,103
Earnings from freight, etc.....	3,737,239	1,316,124	1,237,603
Earnings from all sources.....	5,580,446	2,539,372	2,412,706
Net earnings.....	2,087,069	1,395,790	1,263,697
Dividends.....	..	..	..
<b>PACIFIC RAILROAD'S.</b>			
Miles of railroad.....	2,251	2,251	2,251
Earn. from pas- sengers.....	10,243,956	9,002,276	8,641,013
Earnings from freight, etc.....	18,770,892	15,792,318	15,568,931
Earnings from all sources.....	29,014,848	24,794,594	24,209,944
Net earnings.....	16,614,855	14,374,742	13,648,195
Dividends.....	7,632,250	3,256,530	1,628,265

were but two railroads, the Chicago & Northwestern and the Union Pacific, which exceeded 1,000 miles in length. At the close of last year there were 14 roads exceeding that length, the aggregate mileage of which is 21,906, or an average of 1,569 miles each. Since the commencement of the current year, this method has been carried still farther, and there are companies now operating 3,000 miles and upward. The gross earnings of all the roads whose operations have been reported, have equaled \$529,012,999, against \$490,103,351 for 1878, \$472,909,272 for 1877, \$497,257,950 for 1876, and \$503,065,505 for 1875. The general result of the operations of our railroads for the last nine years is shown in the following statement:

Statement showing Miles of Railroad, Capital Account, Earnings, etc., for nine Years.

YEAR.	Miles Operated.	Capital and Funded Debt.	Gross Earnings.	Net Earnings.
1879.....	84,233	\$4,762,505,010	\$529,012,999	\$219,916,724
1878.....	78,960	4,589,948,793	490,103,351	187,575,167
1877.....	74,112	4,508,597,248	472,909,272	170,976,697
1876.....	73,508	4,408,591,935	497,257,950	186,452,752
1875.....	71,759	4,415,631,630	503,065,505	185,506,438
1874.....	69,273	4,221,763,594	530,466,016	183,570,958
1873.....	66,237	3,784,543,034	529,419,935	183,810,562
1872.....	67,323	3,159,423,067	465,241,055	165,754,364
1871.....	44,614	2,664,627,645	403,329,208	141,746,404

YEAR.	Freight Earnings.	Passenger Earnings.	Dividends Paid.
1879.....	\$386,676,108	\$142,336,191	\$61,681,470
1878.....	365,406,061	124,637,290	53,620,368
1877.....	347,704,548	125,504,724	58,556,312
1876.....	361,137,370	130,129,542	68,039,668
1875.....	363,960,234	139,105,271	74,294,308
1874.....	379,406,935	140,060,081	67,042,942
1873.....	389,635,508	157,384,427	67,120,700
1872.....	340,931,785	132,309,270	64,418,157
1871.....	294,430,322	108,898,886	56,456,681

Classifying the states by their geographical position as usual, it will be seen that the gross earnings for the New England States were \$41,329,825 against \$41,260,203 for 1878 and \$44,590,456 for 1877. Of these earnings \$23,807,143 were received for transportation of freight, mails, etc., and \$17,522,682 for the transportation of passengers. The net earnings were \$15,586,091 against \$13,685,927 for 1878 and \$13,735,746 for 1877. The dividends paid amounted to \$7,236,205 against \$7,506,055 for 1878 and \$6,977,726 for 1877.

The gross earnings of the railroads in the Middle States were \$170,310,846 against \$155,458,968 for 1878 and \$155,943,121 for 1877. Of gross earnings \$127,115,208 were received for transportation of freight, mails, etc., and \$43,195,638 for transportation of passengers. The net earnings were \$70,416,970 against \$61,559,993 for 1878 and \$61,033,089 for 1877. The dividends paid amounted to \$23,911,164 against \$21,148,442 for 1878 and \$24,800,480 for 1877.

The gross earnings of the railroads in the Southern States were \$43,917,284 against \$42,791,284 for 1878 and \$39,812,358 for 1877. The net earnings were \$14,673,357 against \$14,379,958 for 1878 and \$12,064,346 for 1877. The dividends paid amounted to \$2,131,779 against \$2,805,790 for 1878 and \$2,740,793 for 1877. The earnings from freight, mails, etc., were \$22,227,070, and from passengers, \$11,321,478.

The gross earnings of the railroads of the Western States were \$232,379,586 against \$209,822,185 for 1878 and \$190,204,516 for 1877. The net earnings were \$98,961,906 against \$77,958,229 for 1878, and \$66,085,243 for 1877. The dividends paid amounted to \$23,561,262 against \$19,341,222 for 1878, and \$14,556,462 for 1877. The earnings from freight, mails, etc., were \$26,552,029, and from passengers, \$21,776,803.

The gross earnings of the railroads in the Pacific States were \$10,721,157 against \$10,082,491 for 1878, and \$7,706,





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## EDITORIAL ANNOUNCEMENTS.

**Advertisements.**—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

**Contributions.**—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

## ACQUISITION OF LANDS IN CITIES.

The just-published [77th] volume of the New York Court of Appeals Reports contains a decision upon the application of the New York Central & Hudson River Railroad Company to acquire land, which embraces several points of general interest. As is well known, the landed acquisitions of that company in the city of New York have been large. Within this decade it has succeeded, notwithstanding a sharply contested litigation, in enforcing condemnation of an entire block north of the Grand Central Depot, for terminal facilities, additional to its previous possessions in that vicinity. The present petition sought to make a similar extension to its depot on the Hudson River. Its lands there already comprised the strip between the river and the roadway, from Fifty-ninth to Sixty-fifth streets, and this petition sought to obtain in addition the strip from Sixty-fifth up to Seventy-second street. A large portion of the tract thus asked has not been reclaimed from the river, but is under water. The dry-land portion, although not yet much improved by buildings, has been laid out in streets and avenues and in house lots, in the same manner as the up-town territory of the city generally. There was no claim that this new tract was wanted for roadway purposes; the petition of the company stated that it was desired for tracks, switches and sidings where cars might be loaded and unloaded, stored, received and despatched; for freight sheds, engine houses and a coal yard; and for wharves, docks and piers whereon tracks might be laid and alongside which vessels might lie to receive and deliver freight. In other words, the land was desired solely for an extension of terminal facilities.

An objection urged to the petition was that the streets and avenues of a city cannot be condemned to railroad uses; and that to allow the company to acquire house lots, which was all they asked in these proceedings, would be nugatory without a right to the streets. Upon this point the opinion of the Court declares it to be true that the streets of the city cannot be taken by a railroad company, in ordinary proceedings to acquire lands, for the reason that they belong to the city for the benefit of the public at large; but says that consent of the corporation to the use of city streets by a railroad may lawfully be granted, and that it can make no difference to the owners of

lots whether the company condemns the lots first and afterward asks a city license to use the streets, or seeks first the city license and proceeds against the city lots in the second place. There is no rule that authority to use streets and avenues within a city tract cannot be conferred on a railroad, for such a rule would prevent the extension of railroads in large cities, and greatly restrict the facilities for transportation of the products of the country at large to the great centres of trade and commerce.

It is obvious that the petition included the entire water-front of the city on the Hudson River from Sixty-fifth to Seventy-second streets; and one objection to the petition was that a railroad company has no right to be acquiring water-fronts, because navigation by water is not within its corporate purposes or powers. The opinion of the Court declares that in building and using piers within a city a railroad company must be subject to the municipal authority, which, very probably, may regulate the piers owned by a railroad company in the same manner as those of other owners. But there is no abstract rule of law that land under water or a water-front cannot be taken when it becomes needful to the proper business of a railroad. Such a rule would lead to great embarrassment in the prosecution of railroad enterprises. Experience in the management of railroads demonstrates clearly that piers, wharves and docks at which vessels may lie to deliver and receive freight to and from the cars are essential in many cases to the usefulness of a railroad. To hold that the operations of a company must be summarily arrested when they approach a water-front where wharves are required for the accommodation of vessels connecting in transportation with the road would greatly interfere with the accomplishment of the corporate objects. The appropriation of land for wharves to aid the transfer and delivery of freight between railroads and vessels is not an interference with the right of the public to have access to navigable waters for the purposes of trade and commerce, but is in furtherance of it. Even where the water-fronts and the lands under water have been granted to the city corporation for the use of the public, an appropriation of a reasonable portion for the structures of a railroad is not thereby forbidden, for it is entirely consistent with the purposes of such a grant.

A chief purpose in obtaining the land was, according to the petition, the erection of storehouses for keeping property awaiting transportation or delivery to consignees; and one objection urged was that storing property is not a part of the legitimate business of a railroad. The opinion declares that, although a railroad company may not be authorized to establish an independent business of warehousing, it must be allowed to establish reasonable places of deposit or storage for property received for transportation until it can be forwarded, and for property arriving over the road until it can conveniently be taken by the consignees. If it cannot have a warehouse for these purposes at its terminus, it must either allow the property to accumulate in the cars and thus obstruct transportation, or must remove it to some distant place at increased expense to the consignee. A company continues liable, at least as warehouseman, for property transported and remaining undelivered; and to provide a proper warehouse for its preservation is fully within its corporate powers and duties. Even if the company has profitable arrangements with grain elevator companies, produce exchanges or water transportation lines, involving the receipt and delivery at its terminus of large quantities of produce, its arrangements for such storage of the produce as is required by and is incidental to its share of the transportation may be sustained. In short, the only limit to the power to take land is the reasonable necessity of the corporation in the discharge of its duties to the public. This necessity includes the acquisition of lands for all depots and buildings convenient and proper for storing its cars and locomotives when not in use, and property in its charge for transportation.

At the time when the petition was filed the price of real property in the city was much depressed. The purposes for which the lands were desired were in great part to provide for the prospective increase in the company's business. And the land-owners urged that it was unjust to allow their lands to be taken at the reduced prices then prevailing, for the purpose of enabling the company to provide for its wants in the future; especially as any general revival of prosperity in the country, which would cause any material increase in the volume of the company's business, would be almost certain to improve the valuation in the lands. On a review of the evidence a majority of the judges were of the opinion that there was an existing necessity for some increase in the company's facilities, and that the plan proposed was not more than a reasonable provision for the future. And the opinion de-

clares the law to be, that if a necessity exists and the company has exercised reasonable discretion in marking out the land which it proposes to take, the question what property may be taken is for the company rather than for the Court. But land-owners are not liable to have their lands taken for future uses at the prices ruling in an unusually depressed market. The fact that real estate is at the time very low may properly be taken into account in estimating damages.

The method of obtaining terminal grounds and facilities in large cities is the more important because this is fast becoming the chief obstacle to construction of new lines to such cities. Such lands in the larger cities, if so situated as to enable the railroad company to compete on something like equal terms with the older railroads, are usually enormously costly, and moreover in many places they have already become so limited in quantity that not many new lines can find them, not to say buy them. In New York, for instance, deliveries of freight must be made at or near the water's edge. There is virtually but one railroad whose trains enter the city of New York, yet its lands and buildings in the city are probably worth enough to pay the cost of a single-track road from the city limits to the Buffalo city limits. In Jersey City the river front is pretty well occupied with railroad termini. In Chicago, where the roads must deliver on the navigable waters of the river or close to its mouth, and need connection with miles of lumber and coal yards, it is next to impossible to get such areas of suitably situated land as some of the older companies were fortunate enough to secure at a low price in their early days; and in nearly all great cities the existing railroads are protected from the introduction of competitors more by the scarcity and costliness of proper terminal grounds than by any other cause. Those roads are specially fortunate which acquired a sufficient provision of such lands when the cities were small. They virtually share in the enormous advance in the value of city property—amounting in some cases to a considerable percentage of the whole cost of the property.

## UNITED STATES RAILROADS IN 1879.

Again we are indebted to the invaluable publication of Messrs. H. V. & H. W. Poor, the "Manual of the Railroads of the United States," for the only general railroad statistics of the aggregate mileage, rolling-stock, capital, earnings, expenses and profits of the vast railroad system of this country. Their private enterprise institutes, compiles and publishes a yearly census of this great special interest, which is certainly one of the most valuable collections of statistics issued in any country. The general statistics are included in the few pages of the introduction, which we are permitted to copy this week in advance of the publication of the volume, which will appear in a few days. On the figures contained in it is based the following:

The additions to mileage reported are of roads in operation, and do not coincide with the list we compile annually of new roads on which track is laid. This addition is given as 4,721 miles for the year 1879, and the total completed in the United States at the end of that year is reported to be 86,497 miles. The mileage for which reports of capital, etc. are given is an unusually large proportion of that mileage—no less than 84,715 miles, against 78,960 miles last year. The comparison of mileage, rolling-stock, capital, earnings, etc., for the last two years is as follows:

	1879.	1878.	Increase.	P. c.
Miles of road.....	84,715	80,831	3,884	4.8
Miles of second track, sidings, etc.....	20,041	19,818	223	1.1
No. of locomotives.....	17,084	16,445	639	3.9
No. of passenger cars.....	12,000	11,683	316	2.8
No. of baggage, mail and express cars.....	4,519	4,413	106	2.4
No. of freight cars.....	480,100	423,013	57,177	13.5
Capital stock.....	\$2,479,965,945	\$2,292,257,877	\$187,708,068	8.2
Funded debt.....	2,282,540,965	2,297,790,916	15,250,851	0.6
Other debt.....	156,881,032	182,248,556	25,367,524	14.0
Total stock and debt.....	4,919,387,002	4,772,297,349	147,089,713	3.1
Miles of road worked.....	84,232	78,650	5,582	7.1
Cost.....	4,416,510,847	4,166,331,921	250,178,926	6.0
Gross earnings.....	529,012,999	490,103,351	38,909,648	7.9
Working expenses.....	309,096,275	302,528,184	6,568,091	2.2
Net earnings.....	219,916,724	187,575,167	32,401,547	17.3
Interest paid on bonds.....	112,237,578	103,160,512	9,077,066	8.8
Dividends paid on stock.....	61,681,470	53,629,368	8,052,104	15.0

\* "Other debt" is intended to include only such debt as forms a part of the capital invested in the enterprise.

Before proceeding to the consideration of the facts shown above, which we believe to be a fuller showing of the progress of railroad property in this country than was ever given before, we will do well to consider what the "years" are that are compared above, else we shall be likely to be greatly mistaken and



perhaps disappointed. A great improvement in railroad business began in 1878, and continued through 1879, but it was not until the latter part of that year that the improvement became so great and general as to attract attention everywhere, and greatly advance the prices of railroad securities. Now this part of the year largely lies outside of the statistics of Poor's Manual. It gives the figures of the published report for the last fiscal year of each company, including a large number for the year ending with June, 1879, a few for a fiscal year ending earlier (as the Chicago & Northwestern), and a very large number, including all the New York roads and nearly all the New England roads, for the year ending with September. There are a few reports that include months in 1880, it is true; but on the whole the aggregates represent rather the year ending with September, 1879, than the calendar year. And this is especially to be borne in mind in comparing the results in different states. For instance, the figures of the New York and Massachusetts roads are for the year ending with September; those of Pennsylvania roads almost all for the calendar year; those of the minor Ohio and Illinois roads (such as have to be taken from the state reports), for the year ending with June. Many roads show decidedly greater progress for the calendar year than for the year ending with September or any earlier month.

We believe that the statistics of second tracks and sidings and rolling-stock have never been compared before. It is only recently that they have been given with sufficient completeness to make it worth while to compare them. And so far as additional tracks and sidings are concerned, the figures are evidently imperfect still. An increase of only 223 miles during the year is chronicled, and something like that was made on the Erie alone, and there is scarcely a road in the country that does not make some additions of sidings every year. Very likely the figures are approximately correct this year, but too large last year. The aggregate is about 24 per cent. of the mileage of road.

An addition of 639 locomotives, 326 passenger cars, and 106 baggage, mail and express cars is chronicled; less in proportion than the increase in road. Up to the close of the year under consideration, there had been little or no improvement in passenger traffic, in the country at large, but a vast one in freight traffic, which is reflected in the addition of 57,177 cars, or 13½ per cent., to the freight equipment—three times as much as the percentage of increase of road.

With regard to capital there has been a gratifying change, which, however, is chiefly due to the reorganization of bankrupt roads. There is an absolute decrease of 3.1 per cent in the aggregate of stock and debts, in spite of the increase of 4.8 per cent. in miles of road. And this decrease is wholly in the debts of the companies—6.6 in funded and 14 in other debt—this "other" being intended to include only that part of the debt that represents capital—such as funded coupons, etc., and not the incidental unpaid expenses of operation and similar floating debt. Capital stock has increased 8.2 per cent. The whole increase in stocks and debts is a hundred millions of dollars less than the increase in the cost of the roads. The latter, with an increase of 3,884 miles in road, amounts to \$250,000,000, or about \$64,300 per mile of road. A very large amount of it, however, of course, was incurred in improvements to the older roads.

Earnings and expenses are given for nearly the whole mileage for which capital is reported: last year for 2,181 miles less. With an increase of 7.1 per cent. in the mileage reporting, gross earnings are 7.9 per cent., expenses 2.2 per cent., and net earnings no less than 17.3 per cent. greater. Thus the great increase in profits is due rather to the keeping-down of expenses than to the increase in earnings.

It is gratifying to see that though the funded debt was 6.6 per cent. less, the amount of interest paid on it was 8.8 per cent. more. Still, the average interest paid was only 4.91 per cent. which is much less than the bonds call for, and argues some hundreds of millions still in default that year.

The increase in the dividend payments was 15 per cent., but this was on a stock larger by 8.2 per cent., and the average dividend increased only from \$2.34 to \$2.49 per \$100 share.

Below we make comparisons of most of the above items per mile of road:

	1879.	1878.	Inc. or Dec.	P. c.
Capital stock.....	\$29,274	\$28,358	I. 916	3.2
Funded debt.....	26,944	28,427	D. 1,483	5.2
Other debt.....	1,852	2,255	D. 403	17.9
Total stock and debt.....	58,070	59,040	D. 970	1.6
Gross earnings.....	52,134	51,544	I. 590	1.1
Expenses.....	6,280	6,352	I. 72	0.8
Net earnings.....	3,670	3,847	D. 177	4.6
Interest paid on bonds.....	2,610	2,385	I. 225	9.4
Dividends paid on stock.....	1,333	1,312	I. 21	1.6
	732	682	I. 50	7.3

It appears from this that there was a decrease of 1.6

per cent. in the amount of capital per mile of road and an increase of 1.1 per cent. in the cost. The increase in gross earnings per mile was only \$48—less than 1 per cent.—but there was a decrease of 4.6 per cent., or \$177 per mile, in the working expenses, which caused an increase of \$225, or 9.4 per cent., in the net earnings. As we have said, it was chiefly the saving in expenses, rather than the growth of earnings, that increased profits. Though the increase in net earnings was \$225, only \$71 more was paid out to the stock and bondholders. There is nothing particularly strange in this, as profits are frequently divided the year after they are earned.

The course of capital, earnings and profits per mile of road for the past nine years (the returns of the earlier years being much more imperfect than those of the later ones) can be traced below:

	Stock and debt.	Gross earnings.	Expenses.	Net earnings.	P. c. of net earn. to capital.
1871.....	\$59,726	\$9,040	\$5,863	\$3,177	5.32
1872.....	55,116	8,116	5,224	2,892	5.25
1873.....	57,136	7,947	5,172	2,775	4.86
1874.....	60,944	7,513	4,776	2,737	4.49
1875.....	61,533	7,010	4,425	2,585	4.20
1876.....	61,791	6,704	4,228	2,530	4.16
1877.....	61,650	6,382	4,075	2,307	3.74
1878.....	59,040	6,232	3,847	2,385	4.04
1879.....	58,070	6,280	3,670	2,610	4.49

It thus appears that though the aggregate gross earnings of the railroads of the United States were larger last year than ever before, yet their average earnings per mile have been so small but once before—the previous year. With a system growing so largely in mileage, that year shows retrogression which does not have a positive increase in earnings. But in the matter of expenses, 1879 shows smaller ones per mile than any previous year, and the net earnings, which were smallest in 1877, in 1879 were the largest since 1874, in spite of a decrease of one-sixth in gross earnings since that year.

Below are given comparisons for the two years of the mileage, gross and net earnings in each group of states, from which it may be seen where the greatest progress has been made:

Miles of road.		Inc.		P. c.	
	1879.		1878.		
New England.....	8,156		5,700	396	7.0
Middle States.....	14,941		14,000	341	2.3
Southern.....	13,389		12,498	891	7.1
Western and South-western.....	44,104		41,605	2,499	6.0
Pacific.....	2,371		2,004	367	15.0
Pacific railroads.....	2,256		2,256		
Gross earnings.		Increase.		P. c.	
	1879.		1878.		
New England.....	\$41,329,825		\$41,390,203	\$60,378	0.2
Middle States.....	170,310,846		155,458,908	14,851,938	9.6
Southern States.....	43,917,284		42,797,284	1,120,000	2.6
Western and South-western.....	232,379,646		209,852,475	22,527,171	10.7
Pacific States.....	10,721,157		10,082,491	638,666	6.3
Pacific Railroads.....	30,354,241		30,652,130	Decrease. 297,889	1.0
Net earnings.		Increase.		P. c.	
	1879.		1878.		
New England.....	\$15,586,001		\$13,085,927	\$1,900,164	13.9
Middle States.....	70,416,970		61,559,963	8,856,977	14.4
Southern.....	14,673,357		14,379,658	293,699	2.0
Western and South-western.....	98,901,220		77,958,220	21,003,077	27.0
Pacific.....	6,605,390		3,501,625	3,104,765	88.7
Pacific railroads.....	13,672,010		10,489,425	2,817,415	17.0

The New England States with an increase of 7 per cent. in mileage have only a fifth of one per cent. more gross earnings, but as much as 13.9 per cent. more net earnings, this being made by reducing working expenses 6 per cent.

The Middle States had 2.3 per cent. more mileage than in 1878, but their gross earnings were 9.6 per cent. and their net earnings 14.4 per cent. larger. The expenses of these roads increased 6 per cent. and more.

The Southern States had an increase of 7.1 per cent. in mileage, but of only 2.6 per cent. in gross earnings and of 2 per cent. in net earnings.

In the Western and Southwestern States (which have more than half of the whole mileage reporting), the mileage was 6 per cent. greater in 1879 than in 1878, the gross earnings 10.7 and the net earnings no less than 27 per cent. greater. The working expenses of this great system were very little larger than the year before, so that the increase in net earnings (\$21,000,000) was nearly as great as the increase in gross earnings (\$22,500,000). Fifty-eight per cent. of the whole increase in gross earnings in the United States was made on these Western roads, and 65 per cent. of the increase in net earnings. Here is where the prosperity dawned, that has since shone upon the railroad system of the whole country. This began with the farmers, and since has been reflected back on all classes of producers, coming latest in the manufacturing districts of the East, but coming there finally as certainly as in the West, though it will not be shown by the railroad earnings until the reports for the current year are in.

The railroads of the Pacific states show an increase of 15 per cent. in mileage reporting, and 6.3 per cent. in gross earnings. Their extraordinary increase of 88.7 per cent. in net earnings is due to the fact that the rental of the Southern Pacific (leased to the Central

Pacific) is included with net earnings for 1879 but not for 1878, and this also accounts for the great decrease of gross and net earnings reported for the Pacific railroads.

#### A New Trunk Line across Illinois.

The Chicago, Hannibal & St. Joseph Railroad is the title of a corporation recently organized in Illinois for the purpose of building a railroad from Quincy to Chicago, not far from the line of the Chicago, Burlington & Quincy Railroad. It is understood that the proposed road is to be the Chicago outlet of the Hannibal & St. Joseph and the Missouri, Kansas & Texas railroads, and this understanding is supported by the names of the incorporators—five out of the twelve are directors of the Hannibal & St. Joseph and a sixth its General Manager, while three are directors of the Missouri, Kansas & Texas. About 1873 a line was surveyed for such a railroad by the venerable R. P. Morgan, Sr., and for some time he expected to be able to secure the capital to construct it; but the financial stringency prevented. It is on this line, substantially, we believe, that the new company proposes to build—most of the way a little south of the line of the Chicago, Burlington, & Quincy. The country on this line is as fertile perhaps as any in the Union, and for an agricultural country is well peopled; but it is abundantly, or rather superabundantly, supplied with railroads already, and a new one can get no traffic, either local or through, that it does not take from existing roads. That is, it cannot develop any traffic, of any importance, as it would if it were generally fifteen or twenty miles distant from other roads. The object in building it is apparently to secure the profit on the through traffic which the Hannibal & St. Joseph and the Missouri, Kansas & Texas can supply—which is considerable and will increase if they do not have competitors built faster than the traffic grows—and on the local traffic that may be diverted from the adjacent roads. This may be sufficient to support the new road; but if so, it is an indication that the existing roads are making too great profits; for at present they carry all this traffic and a great deal more besides; and the expense of carrying—the cost to the carriers—will certainly be less if done by the old roads than if divided among them and a new one. There are now two roads from Quincy to Chicago—the Wabash, St. Louis & Pacific and the Chicago, Burlington & Quincy—either of which can carry several times as much traffic as it now has by the addition of comparatively slight improvements, which would cost not a quarter as much as a new road. Either can afford to take all the through traffic that the Hannibal & St. Joseph and the Missouri, Kansas & Texas can offer, for less than it would cost a new road to carry it after it was completed; because this would be an addition to its traffic, and expenses per unit of traffic decrease with the quantity carried. If the road is built, the total cost of transportation in the country will not be decreased but increased: it will be a case of three horses provided and kept to do a work for which two are sufficient, and there will be an absolute decrease of the national wealth because of the road. Yet in spite of this, it is not impossible that the projectors of the road are justified, as investors, in constructing the road. Though from the point of national economy the capital may be sunk, or worse, it may yield a satisfactory income to the investors, and that, of course, is what will decide their action.

It would seem, however, that the existing roads might make such terms with the roads west of Quincy as would leave them no adequate motive for building a new road to Chicago, and it is not impossible that it is the unreasonableness of the roads to Chicago that has caused this step to be taken, and that this step may bring them to reason again.

The fact that this organization would make the Hannibal & St. Joseph and the Missouri, Kansas & Texas independent of the Wabash, as well as of the Chicago, Burlington & Quincy, is further evidence that the first-named companies are in no degree under the control of the Wabash, and indicates that these roads and the Missouri Pacific—the latest companies in which Jay Gould has taken an active interest—are likely to work together as an independent system, securing the best terms possible from the Wabash or any other connection, either for interchange of traffic, a lease or a consolidation. These lines are important and would be a valuable acquisition to any east-and-west line east of the Mississippi. When Gould's name first appeared among their directors last year, it was assumed at once that they would become a part of the Wabash, in which for some time he had been a leading if not the leading spirit. A quarrel between the Missouri Pacific and the Kansas City Division of the Wabash showed some months ago that the two were independent, and stoutly maintained antagonistic interests. The Hannibal & St. Joseph has been supposed generally to be independent of the other Missouri roads and of Gould's control, only working with him to secure some common interests. The union of the two to secure a common outlet to Chicago is likely to draw them more closely and permanently together.

#### Crop Prospects.

The Illinois State Board of Agriculture reports the acreage and condition of crops in Illinois, July 1. The acreage of wheat is given as 20 per cent. greater than last year, and its condition, with the exception of a few counties, equal. Since the report there has been unfavorable weather which has probably reduced the condition somewhat below the average of last year.

The corn crop promised about the same as last year. The hay crop vastly more.

The Secretary of State of Michigan reports an increase in



the wheat acreage of the state of 14 per cent. more than last year. Local journals say the crop is as good as last year, and the aggregate yield is estimated at 33,000,000 to 35,000,000 bushels, against 31,000,000 last year.

The United States Department of Agriculture reports the average condition of the winter wheat crops, July 1, at 95 this year, against 91 last year; of the spring wheat 91 this year, against 91 last year. The condition in the district north of the Ohio River, where the largest part of the winter wheat is grown, was 98; west of the Mississippi it was but 84, against 89 last year. Not much winter wheat is sown west of the Mississippi except in Missouri and Kansas. The condition of spring wheat west of the Mississippi is given as 91 in Iowa, only 63 in Nebraska, and 101 in Minnesota. There was not time for much change in condition for winter wheat after this report, the harvest being under way or finished where most of this grain is grown, but the reports indicate that where the harvest was late (except perhaps in Michigan), the change was for the worse. For spring wheat there was still room for great changes, and evidently there has been a considerable change for the worse in Minnesota, as the condition at this date, though likely enough much better than last year, is certainly considerably below 100.

The same Department reports for the whole United States an increase of 1 per cent. in the area planted to corn (the great increase in wheat area has reduced the area available for corn in many of the states). Its condition July 1 was 100, against 93 last year.

The average condition of the cotton crop July 1, is reported at 100—the best for several years. In Texas the condition reaches 111, and as the increase in acreage is largest there, and the crop last year suffered greatly from the drouth, this indicates an enormous increase in the production of that state should no misfortune occur to the crop within the next four or five weeks.

Reports from Omaha say that the decrease in condition of the wheat crop is due to drouth early in the season, but that recent rains have improved it, and that 65 to 75 per cent. of a full crop is expected, of good quality. An inspection of the crops on the lines of the Chicago, Burlington & Quincy in that state including the largest part of the cultivated country south of the Platte results in the conclusion that the corn crop will be abundant. Owing to the failure of the wheat, a good deal was ploughed up and planted to corn, so that the corn area is unusually large—report says one-third more than last year.

The Dubuque Times reports for the larger part of Northern Iowa (in which the chief carriers are the Illinois Central and the Chicago, Milwaukee & St. Paul) that the wheat promises 90 per cent. of the best yield known for 12 years, and that corn promises better than for many years.

#### Provision Exports.

For the fiscal year ending with June last, and for the month of June, the Bureau of Statistics reports as follows the quantities and values of provisions exported from the United States, including under that head fresh and salt beef, bacon, hams, butter, cheese, lard, pork and tallow:

Month of June:	1879-80.	1878-79.	Increase	P. c.
Pounds.....	170,800,648	115,233,918	55,566,730	48.3
Values.....	\$13,813,519	\$8,119,115	\$5,694,404	70.1
Year:				
Pounds.....	1,568,157,912	1,503,739,197	64,418,715	4.3
Values.....	\$120,973,860	\$110,031,058	\$10,942,802	9.7

The exports of each article for the year were, in pounds:

	1880.	1879.	Inc. or Dec.	P. c.
Fresh beef.....	84,008,633	53,838,330	I. 30,170,303	56.0
Salt beef.....	44,934,205	30,709,806	I. 14,224,399	46.3
Bacon and hams.....	695,180,708	729,574,530	D. 34,393,822	4.3
Butter.....	38,873,172	38,152,016	I. 721,156	1.9
Cheese.....	120,875,167	141,042,089	D. 20,166,922	16.0
Lard.....	372,178,544	324,602,713	I. 47,575,831	15.0
Pork.....	96,712,790	83,459,502	I. 13,253,288	16.0
Tallow.....	109,394,635	99,300,122	I. 10,094,513	10.2
Total.....	1,568,157,912	1,503,739,197	I. 64,418,715	4.3

The increase in the aggregate quantity exported is thus quite small, and in view of the low prices obtained for hog products it may appear strange that the increase in values was so much greater. But examination shows that the increase was largely in those articles which bear the higher price per pound. It was largest (56 per cent.) in fresh beef, the increasing exports of which are especially encouraging; but this traffic after all is but a small one, though so much larger than ever before. It was, for instance, but two-thirds as much as the cheese exports, though the foreign demand must be many times as great for fresh beef as for cheese; and it was not even as large as the tallow exports. The total quantity was 42,004 tons, or about 4,200 car-loads—an average of less than 12 per day—which divided among the different lines to the seaboard does not have much effect on the traffic of any one. If the transportation could be made perfectly successful—safe and cheap—we might easily export more beef than hog products, which latter last year counted up to 582,000 tons, or 14 times as much as the fresh-beef exports.

The increase in salt-beef exports is probably due almost wholly to the movement of canned salt meats. A large decrease in cheese exports is noted, and a considerable one in bacon and hams. Taking all hog products together, however, there was a small increase, and a continuation of the growth of this business may be expected, as there are a great many more people in Europe who lack meat than lack bread, and the cheapening of bread to them as the results of better harvests this year will give them more money to spend for meat.

#### Record of New Railroad Construction.

This number of the Railroad Gazette contains information of the laying of track on new railroads as follows:

*Port Huron & Northwestern.*—Extended from Carsonville, Mich., northward to Minden, 19 miles. Gauge, 3 feet.

*Missouri, Iowa & Nebraska.*—A branch is completed from Centerville, Ia., northward to Moravia, 10 miles.

*Denver & Rio Grande.*—Extended from Alamosa, Col., southward to Tres Piedras, N. M., 64 miles. Gauge, 3 feet.

*Texas & Pacific.*—Extended westward to Brazos Crossing, Tex., 17 miles.

*Chicago & Northwestern.*—This company's Chicago & Dakota line is extended from De Smet, Dak., westward to Huron, 37 miles.

This is a total of 147 miles of new railroads, making 2,375 miles thus far this year, against 1,083 miles reported at the same time in 1879, 819 miles in 1878, 781 miles in 1877, 932 miles in 1876, 518 miles in 1875, 727 miles in 1874 and 1,696 miles in 1873.

GOVERNMENT TRANSPORTATION ON THE PACIFIC RAILROADS was supposed to be settled by the law of 1878 providing for the repayment of the government's advances to the Union and Central Pacific companies. Since that time the Union Pacific has been consolidated with or has leased the Kansas Pacific, the Denver Pacific and other lines, while the Central Pacific has long worked an immense mileage of roads in California and Arizona which have received no government advances. Now the Attorney-General advises that all compensation for government transportation over all these lines worked by the Union and Central Pacific should be withheld—an extraordinary position, it seems to us; and the Attorney-General does not even express the opinion that the law contemplates the withholding of such earnings, but advises such action expressly in order that the question may be judicially determined. The law specified that the earnings for government transportation over certain specified roads should be withheld, and how it can be stretched so as to cover services over eight or ten other roads, including two or three thousand miles of lines, many of which had never been thought of when the law was passed, passes our comprehension. The tendency of such an interpretation of the law is not to strengthen but to weaken the government's security. The consolidations and branches are made to increase the earnings of the roads, on which the eventual payment of their debts to the government depends. But if burdens are exacted of the unsubsidized lines when worked by one of the great subsidized companies which they would not have to bear if worked independently or by a third corporation, then there will be a good reason for keeping them separate. And this may have an effect not only on new lines, but on those already united with the Union and Central Pacific. All the Central Pacific's leased lines might be leased to the Southern Pacific, and those of the Union Pacific to the Kansas Pacific; or a lessee company, like the Pennsylvania Railroad Company's "Pennsylvania Company," might take over the leases. And to the country which would profit by connections to these roads it would be a well-founded grievance that the companies most likely to build the branches it needs should have special taxes, as it were, not imposed on branches elsewhere in the United States, forming an obstacle to the construction of the needed lines. The Chicago, Burlington & Quincy may build a branch to a territory in Nebraska destitute of transportation and get part of its support from government transportation. Should the Union Pacific build such a branch, it must get all its support (if this interpretation of the law be upheld) from the people on the road. Yet if the branch is a feeder of the Union Pacific, it helps pay the government debt; while if a feeder of another road, it reduces rather the income on which the government depends for payment.

MEXICAN RAILROAD PROJECTS abound now-a-days. Those most talked about are the ones which the Boston capitalists connected with the Atchison, Topeka & Santa Fe Company have under way or in contemplation. It might be supposed, indeed, that they were the only active parties there, aside from those engaged in the Tehuantepec road. But there are several competitors for "concessions" over the same ground.

The Boston men have begun a line from Guaymas, on the Gulf of California, northward to the Arizona line, and also one from the city of Mexico northward some 250 miles to Leon. The latter is the route of the old Mexican Central Company, and it has several large cities on its line, is over pretty easy ground, and in any other country than Mexico would have a magnificent traffic from the beginning. An English company claims the concession for this road still, and Congress refused to make a new arrangement, but authorized the President to take such guarantees as he saw proper and grant his permission to go on and build subject to government supervision. The Boston people deposited \$150,000 as a guarantee of good faith and responsibility, and have begun the line to Leon, hoping and expecting to get concessions from a later Congress for extensions further north.

Besides the English competitor it appears the Southern Pacific Railroad Company, a California corporation, is also negotiating with the Mexican government for the speedy completion of a section of roads connecting that capital with El Paso del Norte, together with a branch from the proper point to the Rio Grande at Eagle Pass, or Laredo, and another branch from the most suitable point on the main line to the Pacific at or near San Blas. This would make nearly 2,000 miles of roads, in Mexico. The line to El Paso would connect there with a convergence of lines from Colo-

rado, from northern Texas, and also from California. The line to the Rio Grande at Laredo would give a direct route to New Orleans and points north and east, while the line to the Pacific could be made serviceable for connection with San Francisco by water—the all-rail line being provided by the El Paso trunk road.

The Southern Pacific, as every one concerned here knows, is a corporation quite able to carry through such a magnificent programme, as it consists, for the most part, of the same persons who own and control 3,000 or more miles of railroad on the Pacific side of the continent, besides steamer lines, etc. If this arrangement is concluded, it will evidently be a grand stride forward for Mexico, and cannot help but develop her mining and agricultural resources, whether it is immediately profitable to the company undertaking it or not.

THE FRENCH RAILROADS, within a hundred years from the time they were chartered—that is, for the more important ones, about seventy years from now—will become the property of the state, and for the roads proper it will then owe nothing and will have no stock or bonds on which to pay dividends or interest. A Belgian journal estimates that when that time comes, the French line which competes most with the Belgian railroads, having to pay only working expenses and interest on the cost of rolling-stock (which does not revert to the government), will be able to reduce its rates one-half, and it fears for the results on Belgian industries and urges that steps be taken to pay off the capital invested in the Belgian roads meanwhile. It might be supposed that if the state had a great property, the interest on its value should be made to reduce the common public burdens, and not to profit those alone who make use of this property; but there can be no doubt that there would be a tremendous pressure on the part of shippers to have rates reduced so as to leave no margin over the expenditures actually required for the roads, and this would especially be likely to be successful where shippers competed with producers in another country. State railroads, when once (if ever) paid for, are usually supposed to be available as great tax-earning machines. But it is questionable whether they will ever be actually paid for. Doubtless the particular debts incurred for them will be paid off in due time; but the present tendency in Europe is to increase public debts for wars and armies up to the limit of the nation's ability to pay interest; and as soon as a railroad debt is retired, it is likely to be replaced by another, incurred ostensibly for another purpose, but which could not or would not be incurred were it not for the falling-off of one of the previous burdens. In France, it is true, the state has never had any positive and avowed railroad debt, and the cost of the roads has to be retired by the companies themselves; but the state's guarantee of dividends has required considerable payments from it, which have the same effect as interest payments, and as the time of the reversion of the railroads to the government approaches, this prospective source of income will appreciably affect the credit of the state, and probably increase its willingness to borrow as well as the capitalists' willingness to lend.

THE TAY BRIDGE DISASTER has been investigated very thoroughly by a special commission appointed by the British Board of Trade, consisting of Colonel Yolland, the Chief Railway Inspector of the Board of Trade; Mr. W. H. Barlow, President of the Institute of Civil Engineers, and Mr. W. H. Rotherby, who holds the office of Wreck Commissioner in Great Britain. These gentlemen have made elaborate reports. The majority report, signed by Colonel Yolland and Mr. Barlow, and important parts of Mr. Rotherby's report, we publish elsewhere, and commend them to the attention of our readers. They will be found readable by those not familiar with bridge construction, with the exception, perhaps, of the description of the structure, and the "conclusions" especially, and Mr. Rotherby's statement more than all, should be read by everyone. The majority report seems to have been constructed with a view not to hurt anyone's feelings if it could possibly be helped, and generally is confined to a bare statement of ascertained facts, leaving the reader to draw his own conclusions. Rather than say directly that the bridge was not strong enough, the reporters preferred to say that where a strength of 10 was needed to support the strains, the structure had a strength of 8. It means the same thing, doubtless, but it leaves the public to which the report is addressed to draw and formulate the conclusions. But Mr. Rotherby does this in his special report with tremendous vigor and directness. He is a lawyer, and in an investigation of this kind, where a great deal of testimony is taken, skill in sifting evidence is of great value. The answers of Sir Thomas Bouch, the Engineer of the bridge, which Mr. Rotherby quotes, in connection with the evidence on wind pressure and the practice of French and American engineers in providing for it, make a sufficient report in themselves. The English engineering journals all approve Mr. Rotherby's report.

THE ROAD-MASTERS' CONVENTION will be held in Chicago, beginning on the 8th of September next, and it is to be hoped that there will be a large attendance. The Association has had the good fortune to secure the co-operation of Mr. Charles Latimer, Chief Engineer of the New York, Pennsylvania & Ohio Railroad, who has had marvelous success in cultivating enthusiasm for good work and improvement among his own road-masters, and indeed, all men connected with his road department, and whose meetings of the road-masters of that road first gave an idea of the great value of discussions of subjects within the scope of a road-master's duties. As Chairman of the Committee on Questions for Discussion, Mr. Latimer reports a long



and very interesting preliminary list, the fault of which is that it is too much for one convention. But from this list the Committee purpose to select a smaller number—six to ten—for the next meeting, and it requests suggestions from those interested as to which should be selected. A glance at the list is sufficient to show how important is the field which this Association occupies, and how much may be gained by an interchange of experiences and opinions among its members. A very important part of the great economy in the cost of operation attained of late years has been due to the road departments of our railroads, and there are few things more important than the spreading of the knowledge of the improved methods, and keeping alive the spirit of progress.

**WATER RATES** have varied considerably during the past week. Lake rates have fallen gradually, and by Wednesday reached 3 cents a bushel for corn and  $3\frac{1}{4}$  for wheat from Chicago to Buffalo—the lowest rates of this year, but twice as high as the lowest rates of last year, and, we suppose, positively profitable rates. The fall during the week amounts to 1 cent a bushel.

Canal rates have not changed much, and are reported at  $5\frac{1}{4}$  cents for corn and  $5\frac{1}{2}$  for wheat from Buffalo to New York.

Ocean rates have advanced decidedly, beginning at 6d. a bushel for grain from New York to Liverpool, they closed at 8d., which is an unusually high rate at this time of the year, and high at any time.

The present cost of getting a bushel of corn from Chicago to New York by water is about 10 cents, while it costs  $15\frac{1}{2}$  cents to forward it to Liverpool. About a month ago the cost was  $15\frac{1}{2}$  cents from Chicago to New York, and only 10 cents from New York to Liverpool. Thus, what has been lost by the lake and canal seems to have been added to the ocean transportation, and the total cost of exportation remains precisely the same as before.

**THE WEIGHING OF CARS** has proved so advantageous to the lines west of Chicago, that at the recent meeting of the Southwestern Association Commissioner Midgley was instructed to call a meeting of the roads between Chicago and the eastern terminus of the trunk lines, at which they will be urged to weigh all car-load freights and charge by actual weight. The organization for weighing cars in Chicago, under Mr. Midgley's direction, finds that nearly all car-loads received by them weigh very much more than the standard car-load weight for which payment is received, so that those shippers who overload get an advantage over other shippers in the cost of transportation. The amount of freight shipped west has increased so immensely of late that this has become a decidedly important matter. Now great quantities of coal and coke and other cheap and coarse freights are carried, the railroads making almost any rates that will attract the freight in order to get return loads for grain and stock cars that otherwise would have to go west empty.

**FOREIGN IMMIGRATION** is larger this year than ever before, a fact which shows the prosperous condition of the country—at least relatively to the condition of European countries—as certainly as the great improvement in railroad earnings. The Bureau of Statistics reports the arrivals during the first half-year as 263,726, against 99,224 in the corresponding half of 1879, an increase of 165 per cent., while last year's arrivals were somewhat larger than for several years previous. Of the arrivals this year no less than 72,567 came in the month of June, and in that month about 23 per cent. of the whole number were from Germany and Austria, 19 per cent. from Ireland, 17 from Scandinavian countries (Sweden, Norway and Denmark), and 14 per cent. from Great Britain.

#### The Accident in the Hudson River Tunnel.

The work on the tunnel under the Hudson River, which has thus far proceeded without mishap, was brought to a sudden stand early on the morning of July 21. It may be explained that two separate tunnels are being built, each to carry one track, and these have been carried, one about 300 feet, and the other about 50 feet, out under the river. These two tunnels unite in a large tunnel or chamber just at the edge of the Jersey City shore, most of it being under the land, which is there merely a loose filling, chiefly of ashes, held in place by the dock bulkhead, and pervious to water. This chamber was only a temporary construction, and a few days before work had been stopped on the two tunnels and all hands had been put at the permanent lining of this chamber.

At the foot of the shore shaft and at the entrance of this chamber is the air-lock. It must be understood that the work in the tunnel is done under compressed air, which is relied upon in some measure to hold up the silt through which the tunnel is cut while the outside iron casing and its brick lining are put in place. A description written by the engineers in charge says:

"The plan of advancing the work has been as follows: To construct a series of iron rings each 2 feet 6 inches wide, well bolted together, and forming, when completed, an iron shell or tunnel in itself, then to follow up immediately with the lining of brick. The rings in the permanent tunnel are composed of plates of wrought iron three-eighths of an inch thick, and 2 feet 6 inches wide. There are fourteen plates in every ring, the six top plates 3 feet in length and weighing about 170 pounds each, and the remaining plates six feet in length and weighing about 320 pounds each. These weights include the three-inch angle iron that is riveted on the sides and ends of each plate, the rivets being one half an inch in diameter, and placed six inches apart from centres. The plates are fastened together, so as to break joints, with three-quarter inch bolts nine inches apart from centres.

"The heading is advanced as follows: The face of the heading is always the exposed silt, which is so stiff when under the air pressure that it can be cut in benches as a series of garden terraces, and also into steps rising from one terrace to the other. An average slope of about 45 degrees is usually left on this face, and the excavation for and the building of the rings always commence at the top of the tunnel. Usually five rings are building at the same time, each one of the five

rings toward the rear being more nearly completed than the ring directly in front of it. The first four plates require some slight support, but the others are easily held in position by the air pressure, the bolting to adjoining plates, and the support received from resting the plates directly on a bed of the silt.

"The bracing and timber ordinarily used in tunneling are not required on this work. Some 4 by 6 inch timbers are thrown across from the end flanges of the iron plates in order to have a platform for convenience of access to the different parts of the work, but these are not relied upon as braces.

"The material excavated from the tunnel is not carried through the air lock. About half the silt is blown out of the tunnel. It is first reduced to a semi-fluid consistency by mixing four cubic feet of silt with one cubic foot of water, around the open mouth of a six-inch pipe which extends from the tunnel through the air-lock to the lower part of the working shaft. A stop cock on this pipe is then opened and the air in the tunnel allowed to escape and carry the silt with it. The remaining half of the silt is removed to the completed portion of the tunnel, where it will be allowed to remain until the approaches are completed, when it can be more economically removed by cars."

At the time the accident happened the shift of 28 men were at work in the chamber above mentioned. Eight of them had just gone into the air-lock and 20 were at work, when the foreman called them to stop a leak. Such leaks had occurred before and had been readily stopped, but in this case all attempts proved vain, the compressed air escaping and the water coming in so fast that the foreman called to the men to save themselves. They started for the air lock, but, according to the best accounts, just as the first one was in the door one of the iron plates fell against it, forcing it partly shut and wedging fast the unfortunate man. The water was now pouring in, and it was only by a great effort that the eight men already in the lock were able to open the farther door and reach the shaft. The 20 men in the chamber were all drowned.

The official statement of Messrs. Spielman & Brush, the contracting engineers, is as follows:

"This morning at about 4:30 a. m., while the men were changing shifts, that portion of the iron roof adjoining the shaft, and the connecting chamber between the two tunnels and the working-shaft fell in.

"Twenty-eight men were in the tunnel at the time, of whom eight escaped through the air-lock and 20 were killed. The accident occurred at the connection of the iron plates with the brick wall of the working-shaft, which during the changing of the shifts was probably not watched as closely as it should have been, and the compressed air was allowed to escape. This compressed air is relied upon to assist in supporting the roof, which was also sustained by strong timber bracing and the escape of the air has always been prevented by stopping any leaks with the waste silt. As the roof fell the plates closed the door of the air lock into the tunnel, and the water rising rapidly cut off the escape of the twenty men who were killed. The building of this connecting chamber, though a difficult piece of work, has very successfully advanced until now. The roof was all in position and securely bolted. The connection of the iron plates with the shaft was making at the time of the accident. Work will be prosecuted night and day with all the men that can be advantageously employed until the bodies are recovered, which will probably take about three days. The accident will probably delay the work for three weeks."

On the same day, a council of engineers was held to devise means for freeing the tunnel of water, and going on with the work. At this writing, we believe, nothing has been done, but a coffer-dam and powerful pumps have been suggested as the best method. The tunnel is, of course, entirely full, and it is impossible to say how long the work will be delayed.

### General Railroad News.

#### MEETINGS AND ANNOUNCEMENTS.

##### Dividends.

Dividends have been declared as follows:  
Columbus & Hocking Valley, 4 per cent., semi-annual.  
Denver, South Park & Pacific, 4 per cent., payable Aug. 15. This is, we believe, the first dividend.  
Oregon Railway & Navigation Co., 2 per cent., quarterly, payable Aug. 2.

##### Foreclosure Sales.

The Waynesburg & Washington road is advertised for sale July 31, by the Sheriff of Greene County, Pa. The road is of 3 feet gauge, and extends from Washington, Pa., to Waynesburg, 29 miles. Officers of the company, however, say that no sale will take place: the judgment under which it is ordered is not for a large amount, and it will be paid off before the day of sale.

##### Trunk Line Passenger Pool.

In Saratoga, July 21, representatives of the trunk lines, George B. Roberts, President of the Pennsylvania Railroad; William K. Vanderbilt and James H. Rutter, of the New-York Central; George R. Blanchard, Assistant to the President of the Erie Railroad, and Robert W. Garrett, Third Vice President of the Baltimore & Ohio Railroad, met to consider the pooling of all passenger receipts, both east bound and west bound. Without taking any formal action, an adjournment was ordered until September, when an effort will be made to complete an agreement.

##### Trunk Line Board of Arbitration.

The Trunk Line Arbitrators—Messrs. Charles Francis Adams, Jr., David A. Wells and John A. Wright—began a session at the United States Hotel at Saratoga, July 21. The subjects to be considered are regarding the proportion for the lake lines receiving freight for the seaboard from railroads at Sandusky to Buffalo; also, the apportionment of business to be made to the Grand Trunk as one of the lines between Chicago and the seaboard.

##### Missouri River Passenger Meeting.

A meeting of the representatives of the roads carrying passengers to Missouri River points was held in Kansas City, July 9, at which there were present: James Charlton, General Passenger Agent, and D. Bowes, Western Passenger Agent of the Chicago & Alton; H. P. Townsend, General Passenger Agent, G. N. Clayton and W. N. McDearmon, Wabash, St. Louis & Pacific; France Chandler, Missouri Pacific; J. R. Wood, General Passenger Agent, and George Stevens, Western Passenger Agent, Chicago, Burlington & Quincy; S. K. Hooper, General Ticket Agent, and C. N. Lee, Western Passenger Agent, Hannibal & St. Joseph; John Sebastian, Western Passenger Agent, Chicago, Rock Island & Pacific; S. D. Boyd, General Ticket Agent, Indianapolis, Decatur & Springfield; T. Stanley and D. Snow, of the Erie; B. L. Winchell, Kansas City, Fort Scott & Gulf; J. Lyon, Indianapolis & St. Louis.

Mr. A. C. Dawes, General Passenger Agent of the Kansas City, St. Joseph & Council Bluffs, presided, and George H.

Daniels, General Ticket Agent of the Wabash, St. Louis & Pacific Road, acted as Secretary.

The meeting investigated charges against the Chicago, Burlington & Quincy, to the effect that the road had cut rates from Kansas City to Chicago for people going to the grand Knights Templar celebration in August. At the last meeting of the General Passenger Agents' Association a rate of \$14.90 for Knights Templar and their immediate families was decided upon from Kansas City to Chicago and return, and \$20 for all others. This was generally known, and the Chicago, Burlington & Quincy announced that they would carry people to Chicago as cheap as any other line.

Mr. Wood denied the rumor that his line had agreed upon a \$10 rate.

Mr. Daniels offered the following agreement, which was unanimously passed:

Whereas, It having come to our knowledge that various rumors have been circulated throughout the West that the rates for Knights Templar, attending the convocation at Chicago, in August, would be reduced below one fare for the round trip, which rumors appear to have no foundation in fact, therefore, be it

Resolved, That the rate from Kansas City, Atchison, Leavenworth and St. Joseph to Chicago, agreed upon at the general meeting of general passenger and ticket agents, held in Chicago last April, of one fare (\$14.90) for the round trip, for Knights Templar and members of their immediate families, and two cents per mile each way (\$20) for the public be affirmed by this meeting, and that rates from points west and southwest of the points named be based upon the above rates, and we hereby agree not to deviate therefrom, and we further agree that no rebate, drawback, commission or other consideration shall be offered or given as an inducement for securing any commandery or party attending any convocation.

#### ELECTIONS AND APPOINTMENTS.

**Arizona Central.**—The organization of this company has been completed by the election of the following directors: R. H. Bormister, E. P. Clark, John J. Gosper, Prescott, Arizona; Joseph G. Henszey, Samuel A. Henszey, Philadelphia. The board has elected Samuel A. Henszey, Vice-President and Manager; T. A. Eckloff, Chief Engineer.

**Boston & Albany.**—At the special meeting in Boston, July 15, Wm. Bliss and James A. Rumrill were chosen directors in place of D. Waldo Lincoln, deceased, and Chester W. Chapin, resigned. There was some movement to put a Boston man in the board, and James L. Little received 8,440 votes. There were also 1,859 votes cast for Ex-Gov. A. H. Bullock, of Worcester. Mr. Bliss is now General Manager of the road and will, it is expected, be chosen President. Mr. Rumrill is a business man of Springfield and has considerable interests in railroad property; both he and Mr. Bliss are sons-in-law of Mr. Chapin.

**Brotherhood of Locomotive Firemen.**—Mr. Eugene V. Debs, of Terre Haute, Ind., has been appointed Grand Secretary and Treasurer, in place of W. N. Sayre.

**Carolina Central.**—The purchasers of this road at the foreclosure sale have organized a new company and elected the following officers: President, David R. Murchison; General Manager, Wm. McRae; Superintendent, V. A. Johnson. Mr. Murchison is a prominent merchant of Wilmington, N. C.; Gen. McRae was formerly in Wilmington, but is now General Manager of the Western & Atlantic, and Col. Johnson has been Superintendent for several years.

**Cincinnati, Sandusky & Cleveland.**—Mr. Dewitt C. Brown, General Manager, will act as Superintendent also, in place of Charles Howard, resigned. Mr. Columbus T. Tyler has been appointed Assistant Superintendent.

**Cincinnati Southern.**—Mr. B. S. Cunningham has been chosen Vice-President of the Lessee Company, in place of Jacob Vitch, resigned on account of ill health.

**Clifton Suspension Bridge Co.**—At the annual meeting July 19, the following directors were chosen: Warren Bryant, J. M. Hutchinson, Buffalo N. Y.; Delos DeWolf, Samuel B. Johnson, C. H. Smyth, Oswego, N. Y. The board elected J. M. Hutchinson, President; C. H. Smyth, Secretary and Treasurer.

**Council Bluffs & Eastern.**—The officers of this new company are: President, J. T. Baldwin; Secretary, Thomas Bowman; Treasurer, Jacob Williams; Superintendent, W. C. James. Offices at Council Bluffs, Iowa.

**Credit Valley.**—Mr. Henry E. Suckling, of Toronto, Ont., has been appointed Receiver. He is Secretary and Treasurer of the company.

**East Texas.**—The officers of this new company are: President, J. F. Crosby; Vice-President, S. R. Brown; Secretary, W. N. Shaw; Treasurer, W. H. Hollister. Offices at Beaumont, Texas.

**Galestown, Brazos & Colorado.**—Mr. A. J. Walker is now Receiver of this road, which is soon to be sold under foreclosure.

**Niagara Falls Suspension Bridge Co.**—At the annual meeting, held July 19, the following directors were chosen: Delos DeWolf, Samuel B. Johnson, C. H. Smyth, Oswego, N. Y.; Warren Bryant, J. M. Hutchinson, Buffalo, N. Y. The board elected Delos DeWolf, President; C. H. Smyth, Secretary and Treasurer.

**Oregon & California.**—The board has elected R. Koehler, President and Manager; J. N. Dolph, Vice-President; A. G. Cunningham, Secretary and Treasurer.

**Port Huron & Northwestern.**—Mr. S. R. Wadsworth, late of Pennsylvania, has been appointed Superintendent, in place of James McCree, resigned.

**St. Martins & Upland.**—At the annual meeting of this New Brunswick company, on July 6, the following directors were chosen: William Titus, George Barnes, G. W. Titus, John Brady, Jesse Tabor, Edward Nugent, Robert McAfee. At a meeting of the directors Robert McAfee was elected President.

**Southern Pacific.**—Mr. W. G. Curtis has been appointed Superintendent of the Arizona Division. He has been Superintendent of the Stockton & Copperopolis road.

**Springfield, St. Paris & Sydney.**—The board has elected officers as follows: President, P. P. Mart, Springfield, O.; Vice-President, T. E. Hoover, Sidney, O.; Secretary and Treasurer, C. McMorran, St. Paris, O.

**Vermont Valley.**—The new board has elected Gouverneur Morris, President; A. B. Harris, Vice-President; J. H. Williams, Clerk and Treasurer.

**West Jersey.**—Mr. F. J. McWade has been appointed Assistant General Ticket Agent. He has been for some years in the Passenger Department of the Pennsylvania Railroad.

**Windsor & Essex Centre.**—At the recent annual meeting



the following directors were chosen: Alexander Cameron, Wm. McGregor, D. B. Odette, Windsor, Ont.; J. J. Bagley, H. P. Baldwin, C. H. Duhl, James McMillan, Detroit.

#### PERSONAL.

—Mr. E. C. Fellows, Assistant General Superintendent of the Central Pacific Railroad, died at his residence in Oakland, Cal., July 20. He has been connected with the road for a long time.

—Mr. W. N. Sayre, Grand Secretary and Treasurer of the Brotherhood of Locomotive Firemen, has been removed from office by Grand Master Arnold. No charges are made against Mr. Sayre, and no reason for his removal made public.

—Mr. James Brown, General Western Passenger Agent of the New York Central & Hudson River road, died at his residence in Chicago, July 20, after a lingering illness. He was a man of wide experience in passenger business, and was well known among railroad men.

—Col. Wm. Calder, one of the wealthiest and most prominent citizens of Harrisburg, Pa., died in that city July 19, aged 59 years. He was largely interested in iron and other manufactures, was one of the projectors and builders of the Lebanon Valley road, and a director of the Northern Central Company.

—Mr. Benjamin D. Frost, a widely-known civil engineer, died in St. Louis, July 19. He had earned a high reputation from his professional connection with many important public works, of which the most conspicuous was the Hoosac Tunnel, constructed under his supervision. He had been absent from home several months prosecuting surveys for the improvement of the Mississippi River, in which work he was still actively engaged. He was within a few days of completing his fiftieth year; a man of rare and endearing personal qualities.

—At the Boston & Albany stockholders' special meeting, held July 15, the following was unanimously passed:

"Resolved, That the stockholders of this company desire to place on record at this time of the retirement of the veteran Director and President of this corporation, Hon. Chester W. Chapin, an expression of their high sense of the sagacity, fidelity and exceptional ability with which he has discharged the important trusts committed to his keeping, and that in his enforced retirement from participation in the management of the affairs of this corporation, he carries with him their respect and esteem, and their gratitude as individuals and as stockholders, for the wisdom and sound judgment with which he has, during a long series of years, and many mutations of public and financial affairs, managed and protected their interests."

#### TRAFFIC AND EARNINGS.

##### Railroad Earnings.

Earnings for various periods are reported as follows:

Year ending June 30:	1879-80.	1878-79.	Inc. or Dec.	P. c.
Marietta & Cin. ....	\$1,521,000	\$2,013,167	D.	\$491,507 24.4
Six months ending May 31:				
Phila. & Reading .....	\$8,233,518	\$6,233,310	I.	\$2,000,208 32.1
Net earnings .....	1,709,766	1,450,480	I.	310,277 21.3
Six months ending June 30:				
Ala. Gt. Southern .....	\$284,767	\$187,352	I.	\$97,415 52.0
Calro & St. Louis .....	178,379	110,179	I.	68,200 61.9
Cleveland, Mt. Ver. & Del. ....	200,068	183,250	I.	16,818 9.2
Great Western .....	2,386,497	2,043,431	I.	342,976 16.8
Minn. & St. Louis .....	310,100	198,982	I.	111,118 55.9
Marietta & Cin. ....	987,492	906,879	D.	219,387 24.2
Nash., Chatta. & St. L. ....	1,024,705	937,887	I.	86,818 8.3
Net earnings .....	441,955	297,305	I.	144,650 48.7
Paducah & E'town .....	178,317	129,493	I.	48,824 37.7
St. Paul, Minn. & Man. ....	1,438,001			
St. Paul & Sioux City .....	634,535	406,183	I.	138,352 27.9
Five months ending May 31:				
Grand Trunk .....	\$282,755	\$708,111	I.	\$425,356 150.2
Net earnings .....	240,010	147,589	I.	92,421 62.7
Phila. & Reading .....	\$6,790,931	\$5,351,654	I.	\$1,439,277 26.9
Month of May:				
Phila. & Reading .....	\$1,457,881	\$1,332,547	I.	\$125,334 9.4
St. John & Maine .....	5,007	7,880	I.	121 1.5
Net earnings .....	1,053			
Union Pacific .....	2,175,616			
Net earnings .....	906,590			
Month of June:				
Ala. Gt. Southern .....	\$40,821	\$23,263	I.	\$17,558 75.3
Calro & St. Louis .....	33,868	17,728	I.	16,140 91.2
Cleveland, Mt. Ver. & Del. ....	34,932	36,249	D.	3,317 9.1
Ind., Decatur & Springfield .....	36,720			
Minn. & St. Louis .....	72,809	37,845	I.	34,964 47.9
Nash., Chatta. & St. L. ....	144,155	105,047	I.	39,108 27.2
Paducah & E'town .....	29,301	21,181	I.	8,120 38.3
Man. ....	243,407	190,349	I.	53,058 27.9
St. Paul & Sioux City .....	80,328	88,713	D.	8,385 9.5
Second Week in July:				
Chi. & Eastern Ill. ....	\$24,257	\$14,305	I.	\$9,952 69.2
Den. & Rio Grande .....	78,170	22,382	I.	55,788 249.1
St. L., I. Mt. & So. ....	112,700	85,300	I.	27,400 24.2
Week ending July 2:				
Great Western .....	\$98,801	\$75,879	I.	\$22,922 29.2
Week ending July 10:				
Grand Trunk .....	\$187,256	\$145,327	I.	\$41,929 29.0

##### Immigrant Traffic.

The Michigan Central during the six months ending with June delivered in Chicago 54,200 immigrants, about three-fourths of whom were ticketed to points further west.

##### Grain Movement.

For the week ending July 10 receipts and shipments of grain of all kinds at the eight reporting Northwestern markets and receipts at the seven Atlantic ports have been, in bushels, for the past seven years:

Year.	Northwestern Receipts.	Northwestern Shipments.	Total.	By rail.	By water.	Atlantic Receipts.
1874.....	3,082,391	3,205,311	6,287,702	276,288	8.6	3,531,237
1875.....	3,112,134	3,418,258	6,530,392	1,173,995	34.4	2,418,673
1876.....	2,628,445	2,877,186	5,505,631	1,228,678	42.7	4,873,451
1877.....	2,550,086	3,341,924	5,892,010	609,103	20.0	2,229,164
1878.....	3,118,902	2,967,635	6,086,537	922,931	31.1	2,907,445
1879.....	4,250,273	4,135,039	8,385,312	1,440,081	34.9	3,983,935
1880.....	4,500,927	6,375,078	10,876,005	1,605,899	25.2	8,137,107

The receipts of the Northwestern markets, though comparing favorably with the receipts of corresponding weeks of previous years, were considerably less than in the previous week. The shipments of these markets, however, were con-

siderably larger, and for this season of the year, extraordinary—55 per cent. more than in the corresponding week of last year, when they were much larger than ever before. The receipts at Atlantic ports were enormous, and have seldom been exceeded at any time of year. Evidently the large surplus of the last crop left over has been hurried forward to make room for the new crop. The rail shipments from the Northwestern markets are somewhat smaller than for a few weeks past—probably on account of lower lake rates. Of the receipts at Northwestern markets for the week, Chicago had 54.2 per cent., St. Louis 15.9, Toledo 12.1, Peoria 8.3, Milwaukee 3.5, Cleveland 2.9, Duluth 1.9, and Detroit 1.2 per cent.

Of the receipts at Atlantic ports, New York had 48.6 per cent., Philadelphia 16.9, Baltimore 12.3, Montreal 8.5, New Orleans 6.8, Boston 6.8, and Portland 0.1 per cent. Philadelphia, Montreal and New Orleans all have unusual proportions this week, and New York is a little below its recent average.

Exports for the past four weeks have been:

	July 14.	July 7.	June 30.	June 23.
Flour, bbls.,	101,555	103,177	51,300	74,146
Grain, bush.,	6,261,017	5,761,139	8,632,476	6,857,719
Four weeks ending July 14.....			330,128	27,512,351
Previous four weeks.....			343,029	22,347,983
Eight weeks of 1880.....			673,157	49,860,334
Corresponding eight weeks of 1879.....			553,545	36,887,743

Thus the grain exports were 23 per cent. greater in the last than in the previous four weeks, and for the eight weeks the exports were 22 per cent. greater in flour and 36 greater in grain, than in the corresponding period of 1879, when the exports were enormous. This year they have been at such a rate as would require yearly exports of about 350,000,000 bushels to keep them up. In the different grains the comparison with the corresponding week of last year shows an increase of 41 per cent. in wheat, of 31 in corn, and of 134 per cent. in oats, with a decrease of 74 per cent in rye.

#### Coal Movement.

Coal tonnages reported for the week ending July 10 are as follows:

	1880.	1879.	Inc. or Dec.	P. c.
Anthracite .....	392,360	527,808	D.	135,448 25.7
Semi-bituminous .....	60,422	78,265	D.	11,843 15.1
Bituminous, Penna. ....	30,354	31,026	D.	672 2.2
Coke, Penna. ....	25,691	22,259	I.	3,432 15.2

This was a short week, a holiday generally observed being taken out of it.

Coal carried to Seattle, Wash. Ter., by the Seattle & Walla Walla road and shipped by sea from that point in June was 9,528 tons. For the six months ending June 30 the shipments were: 1880, 61,900; 1879, 72,600; decrease, 10,691 tons, or 14.7 per cent.

The tonnage of the Lehigh Valley Railroad for the six months ending June 30 and its disposition were as follows:

	1880.	1879.	Inc. or Dec.	P. c.
Shipped north and west and delivered on line.....	878,234	858,240	I.	19,995 2.3
To Lehigh Canal at Mauch Chunk .....	15,490	24,457	D.	9,968 36.8
To Morris Canal at Port Delaware .....	97,870	67,300	I.	30,570 45.3
To Philadelphia for New Jersey Division .....	597,950	713,762	D.	115,812 16.2
To Philadelphia for D., L. & W. R. R. ....	45,577	5,400	I.	40,177 744.0
To Philadelphia for Pa. R. R., Bel. Div. ....	391,042	367,237	I.	23,805 6.0
Total .....	2,026,137	2,036,405	D.	10,268 0.5

The falling off is chiefly in tide-water shipments, local and western coal showing a gain.

#### RAILROAD LAW.

##### Suing a Receiver.

An important case has just been decided by Judge Baxter, of the United States Court (in Cincinnati), and the judge has rendered a matured and well-considered opinion, in which he ruled that in a suit for damages brought against a receiver of a railroad the case may be found in a court of chancery.

In the course of his decision he says:

"The defendant, a railroad corporation, issued a large number of bonds, and executed a mortgage on its road, franchise and property to secure their payment; and having failed to pay the interest as it accrued, a bill was filed in this court to foreclose the security. On complainant's application, a receiver was appointed to preserve and operate the property *pendente lite*. One of the trains ran over and killed a Mrs. Cook, whose husband, after administering on her estate, sued therefor in a state court. But at the instance of the Receiver he was ordered to dismiss his suit, with leave to be heard in this case. He thereupon filed his petition here, set forth his cause of action, and demanded a trial thereof by a jury.

"These questions have been definitely settled by repeated adjudications. A receiver represents the court. There can be no interference with money or property in possession of a receiver without permission of the court appointing him. The power to appoint receivers is of great utility. \* \* \* But an injured party is not without a remedy. He may apply to the court having the custody of the property or fund for appropriate relief. And upon such application he will be permitted to go before a master or sue in a court of law.

"A court appointing a receiver, although not compelled to assume jurisdiction of all controversies to which the receiver may become a party, but at liberty to leave their determination to any court of appropriate jurisdiction, may nevertheless assert its right to take all such controversies to itself. Its power is unlimited for purposes of protection, and it may restrain the prosecution of suits against the receiver in other courts, and punish, as for contempt, any interference with its officers by force or by suit.

"Such has been the uniform holding of the courts until recently, since which modifications of the rule have been attempted by a few exceptional adjudications and by legislative enactments in some of the states. A statute of this kind exists in Ohio. But this statute cannot control the action of this court. Nor can we yield to the modification of the rule adopted by some of the state courts. These decisions have been ably reviewed by Love, judge in the case of Thompson vs. Scott, and his refutation of them maintained by a cogency of reasoning that ought, we think, to forever foreclose all further discussion of the question. Mr. High, who advocates (in an article published in the *Southern Law Review*) the new doctrine, admits that 'the weight of authority is adverse to the exercise of any right of action against a receiver, by any court other than that from which he derives his appointment and to which he is amenable.'

"No other theory than that insisted on by us could be practically maintained, as the facts of this case will sufficiently

demonstrate. The defendant, the owner of an important line of railroad, upon application duly made this court, in the exercise of its unquestioned jurisdiction, seized the property and put it into the hands of a receiver, to be held, preserved and operated for the benefit of the parties entitled, until the rights of the parties could be judicially ascertained and declared, and a sale of the property effected. We must presume that everybody dealing with the receiver knew the character in which he was acting; that he was the representative of the court, and acted under his orders, and that if any damages were inflicted by reason of any breach of contract, or wrongful or negligent act of the receiver, or of his employees, this court was competent to award pecuniary reparation.—*Louisville Evening Post*.

#### THE SCRAP HEAP.

##### Railroad Equipment Notes.

J. G. Brill & Co., in Philadelphia, have just delivered two passenger cars to the Boston, Winthrop & Point Shirley road.

The Baldwin Locomotive Works, in Philadelphia, have recently delivered several consolidation engines with 20 by 24 in. cylinders to the Chicago, Burlington & Quincy road. They are to be used on the heavy grades of the Iowa Division.

The Westinghouse Air Brake Co., in Pittsburgh, has an order for automatic brakes for the passenger equipment of the New York Central & Hudson River road; also for automatic brakes for eight engines and 75 cars for the Boston & Albany road.

The Gilbert & Bush Co., at Troy, N. Y., has just completed ten passenger cars for the Flint & Pere Marquette, and two for the Detroit, Lansing & Northern road.

Wells, French & Co., of Chicago, have just delivered 300 stock cars to the Chicago, Burlington & Quincy, and are building 100 grain cars for the same road.

The Nashville, Chattanooga & St. Louis shops, in Nashville, Tenn., are building a new wrecking car and a number of flat cars for the road.

New car works are to be built in the town of Dallas, Oregon.

The Lehigh Valley shops, at Easton, Pa., are building a pay-car for the road, which is to be very handsomely fitted up.

The Barney & Smith Manufacturing Co., at Dayton, O., are building 200 grain cars for the Chicago, Burlington & Quincy road.

The Philadelphia, Wilmington & Baltimore shops, in Wilmington, Del., are building a number of light cars to be used on the suburban trains out of Philadelphia.

The Wythe Speed Recorder Co., at Kent, O., has orders for 60 of its speed recorders for the New York, Lake Erie & Western road.

##### Iron and Manufacturing Notes.

The Paxton Rolling Mill, at Harrisburg, Pa., is running on a large order for boiler plate iron.

The Cleveland Rolling Mill Co., at Cleveland, O., is filling a large order for steel rails for the Ohio & Mississippi road.

The United States Wind Engine and Pump Co., at Batavia, Ill., has forwarded drawings and specifications for Halladay wind-mills of large size to South Africa, where it proposes to use them in the diamond mines. The Rajah of Theend, in Hindostan, has decided to adopt the Halladay wind-mill to pump water for irrigating purposes, and his order will be filled as soon as some minor details are adjusted.

Franklin Furnace, in Sussex County, N. J., was in blast on the run just finished exactly 52 weeks. In that time it made 22,741 tons 7 cwt. of pig iron, an average of 437 tons 7 cwt. per week. The average yield of iron was 47.88 per cent. of the ore.

The Clayton Steam Pump and Air Compressor Works, in Brooklyn, N. Y., have obtained the contract for the balance of the air compressors to be used in building the Hudson River Tunnel. The air compressor of their make already in use in the tunnel has given excellent satisfaction to the engineer in charge.

The Hollidaysburg (Pa.) Rolling Mill has stopped two weeks for repairs.

H. B. Brown & Co., at East Hampton, Conn., have lately shipped nut and bolt cutting machines to the Lehigh Valley road, the Lackawanna Iron & Coal Co. and others; also a large cutter to Japan.

Anderson & Co., in Pittsburgh, have just added a large new plate and bloom mill to their steel works.

No. 4 furnace of the Crane Iron Co., at Catasauqua, Pa., has gone out of blast after a run of four years, and will be repaired, ready for a fresh start.

The Allentown (Pa.) Rolling Mill has resumed work in all departments.

The Mahoning Valley Iron Co. last fall bought the old Valley Rolling Mill at Youngstown, O. New machinery has been put in and the mill is now running on bridge and car iron. The company has just completed its new Hannah Furnace, which will make 60 tons of pig iron a day.

##### Bridge Notes.

The Detroit Bridge & Iron Works have taken a contract to build seven iron bridges on the Detroit, Butler & St. Louis road.

The Toronto (Ont.) Bridge Co. has taken a contract for four fixed spans and two draw-spans over the Welland Canal; also for several bridges for the Canadian Pacific.

The Baltimore Bridge Co. has taken the contract for a bridge over the Ouachita River at Monroe, La., for the Vicksburg, Shreveport & Pacific road.

The Mt. Vernon (O.) Bridge Co. is building several highway bridges, besides iron-work for buildings.

Contracts were to be received by the Commissioners of Nansemond County, Va., until July 24 for an iron draw-span 140 ft. long over the Nansemond River at Suffolk.

Jones, Benness & Gibson, bridge-builders and contractors of Philadelphia, have the contract for a new 20-stall round-house for the Pennsylvania Railroad, at West Philadelphia.

##### Prices of Rails.

Steel rails are firm and unchanged, prices being say \$62.50 per ton at mill for immediate, and \$60 for winter delivery.

Iron rails are more active, and some large orders are reported on the market. Quotations are \$45 per ton at mill for heavy sections, but buyers are holding out for lower prices, and \$42.50 is said to have been offered, but not taken, though a dollar a ton may be conceded on a cash order.

For old iron rails sales are reported in Philadelphia at from \$23.75 to \$25 per ton. Some holders look for higher prices and ask \$27 per ton, but no sales are reported above \$25.

##### Red Flags.

A few days since a man signaled an Erie express train on the meadows, and when it stopped coolly informed the con-



ductor he wanted to ride to Jersey City. He thought it very smart, but changed his mind when upon reaching the ferry, the conductor handed him over to an officer, it being a misdemeanor under the state laws to stop a train in that way. The offense is punishable by a fine of not more than \$100, or by imprisonment for not more than one year, or by both fine and imprisonment.—*Paterson (N. J.) Press.*

An engineer on the Bound Brook Line has propounded a theory that Dr. Tanner has been hired by the Reading Receivers to see how long a man can go without eating, and that the result is meant to furnish data from which the lowest amount of wages on which a man can exist will be calculated, and the pay of railroad employes will be reduced to the minimum figure.

A Spanish time-table: In the station at Madrid. A traveler comes to learn the hour of the express to Seville. Traveler—"At what hour does the train start?" Employé—"At nightfall." Traveler—"At what hour does it arrive?" Employé—"At dawn." Traveler—"Thank you." (Exit.)

#### Large Iron Estates.

It is a fact not generally known that four of the largest landed estates in this part of the country are owned by corporations on the line of the Erie Railway, between Monroe, Orange County, and Ramapo, Rockland County. The aggregate of land owned by them is about 44,000 acres, and most of it is mineral land lying in the mountains in the town of Monroe. The Parrott Iron Co., consisting of Peter Parrott and his two sons, own 9,000 acres of iron-ore land in Monroe and Blooming Grove and some in Warwick. The Lorillards own an estate of 11,000 acres, mostly in Monroe, on which a new passenger station called Lorillard has lately been established. The Sterling Co., composed mostly of Philadelphia capitalists, which has furnaces at Southfield and Sterling, with a railroad connecting them, has 17,000 acres, nearly all in Monroe and Warwick. The title runs back 200 years, and was vested in Lord Sterling, from whom the place takes its name. It was on this tract that the great chain was forged which was stretched across the Hudson at West Point during the Revolution, to keep British ships from going up the river. It was forged by Peter Townsend, grandfather of the present Peter Townsend, who was a large owner in the Sterling Works. Henry L. Pierson, of the Ramapo Car Wheel Works, owns 7,000 acres in Orange, Rockland and Passaic counties. Iron-works were established there a century ago by three brothers, one of whom, Jeremiah Pierson, was father of the present owner. But nails were first made here, and steel was first manufactured here in this country. The steel made here was used in the manufacture of saws at a factory near Slootsburg, established by Daniel Jackson, who died in Chester some years ago.—*Middletown (N. Y.) Press.*

#### Saving a Train.

The following incident, related by Mr. Henry Waterman, a practical railroad man and inventor, illustrates what presence of mind will accomplish in time of great danger. Mr. Waterman said that in the year 1871 he was at work in the railroad shop at Greenbush upon some of his locomotive improvements, and was in the habit of riding home to Hudson each evening upon a locomotive. It was his practice to jump upon the engine and place himself upon the fireman's seat, on the left side of the cab. On one occasion, as he was about to get up on the engine, he met Mr. McQueen, Superintendent of the Schenectady Locomotive Works, and upon his invitation, concluded to ride to Hudson with that gentleman in one of the passenger cars. A short time previous to this, Mr. McQueen had built and placed upon the road a new locomotive called the Tobin, which he was very proud of. She was placed in charge of William Lewis, engineer, and had been running but a few days. The Tobin was at the time attached to the evening up train. Arriving at a point near Schodack Station, Mr. Waterman remarked to Mr. McQueen: "Right here we are in the habit of passing Lewis," at the same time holding his watch in his hand. "Our train sped along," said Mr. Waterman, "until Lewis was five minutes behind his usual time, a fact which was commented upon as being singular. All at once, the sharp, shrill signal of danger was blown, the patent brakes flew to their work, and in a few seconds our train was at a standstill. Thinking that the up train was wrecked, and that we were stopped on that account, myself and McQueen rushed to the door of the car, jumped off, and discovered that instead of the up train it was the engine of our own train that was wrecked. We heard the water escaping from the boiler, and, upon running up forward, we found that one of the driving-wheels had been broken from the axle and lay upon the track, covering both rails. The imminent danger to the up train, which was expected every moment, was comprehended at a glance. It was dark, and a driving-wheel weighing about 3,600 pounds was firmly lodged on the track. What was to be done? Thinking and doing had to be done quickly, and so thoroughly frightened were the passengers and train hands that they seemed to be demoralized. Said Mr. Waterman to our reporter: "I took charge of affairs. Calling for a red light to send down the track to stop Lewis, I was horrified to hear from the lips of the brakeman that the flying water from the wrecked locomotive had put out the red light! I took from my pocket a red silk handkerchief, which I always carry, and, seizing a common lantern I wrapped it about the globe and shouted to Mr. McQueen to take a man with him, crawl under the wreck, amid steam and water, and go quickly down the track to stop Lewis, at the same time saying that I would attend to things here. Calling to the fireman, who was on the engine, to hand me a pinch-bar, I told him to stay on his engine and put out the fire. The importance of this was that the engine had a heavy fire at the time, and the boiler was losing water rapidly, as the accident had knocked off the parallel rods, and they, in dashing about, had in turn knocked off the check valve. Taking the pinch-bar, I made my way back to where the heavy driving-wheel lay upon the up track, and went to work with a will to get it off the track. Placing the bar under the wheel, I exerted so much strength upon it, under the great excitement I was laboring under, which gave me unusual nerve, that the bar was badly sprung; but I got the wheel sliding, and soon had it rolling down the bank, and I assure you it was a great relief, as danger to the up train was now past. I was as weak as a child after the reaction set in. In case Lewis had not received the warning, I was aware that my only safety would be in diving under the passenger car to the other side of the track; but, under the excitement, I did not hesitate about taking any chances. When the obstruction was removed, I looked up and saw that Lewis had stopped his train just at the head of the other train. On going up to him he was complaining loudly of the treatment he had received, his face being covered with blood. It appeared that Mr. McQueen and the man with him, on going down the track with the hastily-prepared red light, were fearful that the light would not prove effectual in signaling Lewis, and they each picked up a handful of gravel, and, as Lewis passed by, hurled the gravel at the glass windows in front of the cab. Lewis had noticed the signal, however, and had his face close up to the window, the result being that the small stones broke the glass and cut his face, as stated." Mr. Waterman

says that not over three minutes could have elapsed from the time the train on which he was a passenger was brought to a standstill before the up train also came to a stop at the head of the wrecked locomotive.—*Hudson (N. Y.) Republican.*

#### He Obeyed Orders.

It was just this side of Detroit that a man entered the car, took a seat, and devoted his attention to the morning paper. After a time the conductor came along and touched him gently on the shoulder, but without effect. Again he tapped the passenger on the arm, but there was no response, and the official had to speak.

"Ticket, sir?"

"The traveller looked wearily up from his paper and said, 'I haven't any ticket.'"

"Money, then?" said the conductor

"I haven't any money."

"Then you must get off at the next station."

"I will," was the submissive response, and the conductor passed along. The train stopped at the next station, started again, and was bowling along at twenty miles an hour, when the conductor again came through and saw the traveler on the same seat as before.

"I told you to get out of this car," he said, somewhat sternly.

"You did."

"Why didn't you do it?"

"I did."

"And then got in again?"

"I did."

"Now look here, my friend, I don't want any more of this nonsense. Get out of the car at the next station, and stay out. You hear me?"

Again the train stopped and again it started, and again, but in another car, the conductor found the self-same traveler, as calm as a June morning.

"You here again?" he asked.

"Yes."

"Didn't I tell you to get off this train and stay off?"

"No."

"I did."

"No; you told me to get out of that car and stay out, and I did."

"Now, my friend," said the conductor, "listen to me, and mind you do just what I tell you. At the next station you get off this train and stay off. Do just as I tell you or you will get into trouble."

"Agreed," said the traveler, and the conductor passed on.

Again the train stopped and started, and again the traveler turned up on the train. The conductor was just reaching for the bell-rope to stop the train and eject him summarily, when the traveler stayed his hand.

"I obeyed orders," he said. "You told me to do just as you ordered. I got out and stayed out until you said 'All Aboard!' Then I got aboard, for I didn't want to get into trouble, you know."

The conductor gave him his hand, and it was noticed that, later in the day, they ate together in the dining-car, and ate heartily.—*Boston Transcript*

#### Catching Free Riders.

The officers of the Old Colony Railroad have been much troubled of late by a gang of young rascals, who have several times tried to beat their way to Silver Lake upon picnic trains. Quite a number succeeded in stealing a ride on Tuesday, and, emboldened by this success, a crowd of twenty-five boarded the train this morning, thinking to enjoy a day's fun in the country without expense. They impudently informed the conductor that they had no money with which to pay their passage, and they even wanted to know what he was going to do about it. To their dismay, the latter inquiry was very soon answered. With the assistance of the train hands they were all put in one car and the doors were locked until the train arrived at Quincy. The car was then switched upon a side track, and an engine at hand soon whisked them off in an opposite direction. By telegraphic appointment several officers of Station 4 were in waiting at the Boston station, and on seeing the reception prepared for them the boys experienced a terrible revulsion of feeling. Their impudence vanished, and was succeeded in several cases by tears and entreaties, which proved alike unavailing. Carriages were provided, and they were taken to the station-house and locked up. They are all Boston boys, their ages ranging from 11 to 18 years. They will be arraigned in the Police Court for evading fare to-morrow morning.—*Boston Transcript*, July 14.

#### Scalpers' Tricks.

The Indianapolis papers say that for some time past the officials of the Cleveland, Columbus, Cincinnati & Indianapolis Railroad have been aware of the fact that bogus, or, more properly, "stuffed" and raised tickets have been manufactured by scalpers, who were thus enabled to offer extraordinary inducements to persons who purchase them and still leave a margin for an enormous profit. One plan of the scalpers was to take tickets that had been punched by the conductor and stuff the hole so that it was impossible for one unaccustomed to the mark to notice the fraud. Another plan was to purchase a quantity of tickets from a station near Cincinnati, paying 40 cents or perhaps 50 cents apiece therefor, and then cutting out the name of the station and inserting the word Cleveland or Columbus in its place, and then sell the tickets at an enormous advance on first cost. About a month ago a number of detectives from New York were put on the scent. They succeeded in tracking the case to Cleveland, and have now in their possession a number of the raised or stuffed tickets, and several of the parties implicated have been arrested. These are George C. Mace, keeper of a cigar-store and ticket office at Cleveland, and his clerk, Lewis Breeler. The officers of the road say the cases will be prosecuted to the bitter end, and an effort will be made to crush this sort of traffic entirely.

#### A Railroad Ship Yard.

The Central Pacific Company's ship yard at West Oakland is at present the scene of great activity. The yard, which is the largest on the coast, Mare Island Navy Yard excepted, is crowded with craft in the various stages of construction, from the keel on the stocks to the finished steamer, awaiting but to be launched to begin its career of usefulness. Of the two sister side-wheel steamers, now nearly completed, the Modoc will be launched first, probably early next week. These steamers are each 180 feet keel by 43 feet beam, with 25 feet added, over all, and 9 feet depth of hold. The engines were made by the company at its shops at Sacramento, under the supervision and from the plans of A. J. Stevens. They are surface condensing, high pressure, 500-horse power, with 22-inch cylinder and 8 feet stroke. The boilers, of which there are two, are tested to 120 pounds of pressure, and will carry 80 pounds. Steam steering gear, of considerable originality, is employed. Attachment is made to the tiller instead of to the rudder, as has heretofore been the practice, and allowing the steering to be done either by hand or steam power. One

of the most ingenious arrangements on these vessels is the pneumatic signal bell. Under the old system of wire pulls, derangements continually interfere with the proper sounding of the signals. The upper deck is divided into a large cabin, saloon and staterooms. Altogether these vessels present a model of strength and utility. There is upon the stocks a grain barge, 225 feet keel, 42 feet beam and 6 feet depth of hold. This barge is expected to draw 9 inches when unloaded. The work is progressing speedily, the keel and most of the ribs having been laid within a few days. The great dredger, which is in course of construction, is an object of considerable interest. It is larger than either the Samson or Goliath, heretofore the largest on the coast. Like them the table to the swinging gear is on the hurricane deck instead of on the main deck, as is usual. Much other work is projected, and will be commenced as soon as space in the yard will allow.—*San Francisco Call.*

#### The Improved Outlook for Iron.

The *Iron Age* of July 15 says: "The very greatly improved outlook for iron in the East since last week is so fully noted in our trade pages that it is scarcely necessary to discuss the subject editorially. As bearing upon the question of the stability of this improvement, it is gratifying to note that the movements and happenings in the iron trade at Pittsburgh and in the West during the past fortnight have been of more than usual importance, and, as indications of the present condition and future prospects of this trade, are of the utmost moment. These movements indicate the prevalence of a belief that the bottom in prices has been reached, and, as a consequence, buyers and speculators who have been waiting for this state of affairs to be reached have begun to buy. So long as these parties were in doubt as to the course of prices it was impossible to get them to buy iron, and every attempt to force sales, or even a moderate effort to sell, was regarded as another evidence of weakness, and made the consumer still less anxious to buy. During the past two weeks this has changed, and some very heavy sales have been made."

"For the week ending July 9 the Pittsburgh brokers reported sales of upward of 16,000 tons, and it is stated that sales made and not reported will make an aggregate of 20,000 tons sold in a week. This is the largest aggregate ever reported in the history of Pittsburgh for a similar period, with one exception. Of the 16,000 tons reported sold, 10,000 are coke or bituminous iron, 6,000 anthracite. Another feature of the sales is that the iron was nearly all forge iron, or iron for mill uses, only 545 tons being foundry. It is stated that this movement is largely speculative, and that much of the iron which lately changed hands will be held for higher prices, but at the same time some mills are anticipating future wants. The report of the condition of furnaces, given in our last issue, was quite favorable to furnacemen in showing a larger proportion out of blast than had been believed to be in this condition. It of course goes without saying that furnacemen, in view of this sudden increase in demand, are firm in their views."

"In merchant iron the market has not as yet shown any very heavy sales, but the best makers at Pittsburgh are very much firmer than they were a month ago. They would find no trouble in filling their books with orders at the rates ruling on the 1st of June. Large buyers have, within a very short time, visited Pittsburgh and endeavored to place orders at these rates, and have found themselves unable to do so. The best-informed manufacturers expect the heaviest fall trade ever known."

#### Struck by Lightning.

A singular occurrence happened on the Chattanooga Railroad last week. Conductor House's train was running through a terrific storm this side of Murfreesboro, when the engineer saw a large ball of fire rushing down the steel rails toward the engine. As it passed under the locomotive he felt a sudden shock that seemed to jar the entire train. The fireman looked back to see whether any damage had been done to the train. Just at that moment there was a loud explosion opposite the ladies' car and a telegraph pole was splintered from top to bottom. All the passengers in the coach were badly shocked and frightened, the ladies especially manifesting their terror by loud shrieks.—*Nashville (Tenn.) American*, July 18.

#### OLD AND NEW ROADS.

**American Transfer Co.**—This company has recently completed an oil pipe line 63 miles long from Salamanca, N. Y., to Buffalo, and is now carrying oil to that city. From Salamanca the pipe runs along the Erie road westward as far as Comstock's Crossing, 21 miles distant; thence it finds its way over the hills in a northwesterly direction to the town of Gowanda, six miles away. After reaching this point, the course lies along the road-bed of the Buffalo & Southwestern to its lake terminus. The road connects at Salamanca with the one from the Tarport, and the two will be worked as one line, making a total length of 84 miles. There are two stations on the line, the first at Cattaraugus, 32 miles from Tarport, and the second at North Collins, 25 miles from Cattaraugus.

**Arizona Central.**—Work has been begun on this road from the Southern Pacific at Maricopa Wells, Arizona, to Prescott, the capital of the territory. It will be about 100 miles long. The location of the road will soon be completed.

**Atlantic & Pacific.**—At the starting point of this line at Albuquerque, N. M., the grounds for depots, round-houses, machine-shops and other buildings, have been graded and the buildings are being constructed with all possible celerity. The bridge across the Rio Grande is nearly completed, and 60 miles of grading are nearly ready for ties and rails. The contract is let for grading the road-bed to Wingate, 140 miles west, and track-laying is to commence immediately.

The surveying parties have completed the final location through New Mexico, and are now at work in Mohave County in Arizona.

**Carolina Central.**—The bondholders, who bought this road at foreclosure sale in April last, met in Weldon, N. C., July 14, and organized a new company by the same name.

**Champaign, Havana & Western.**—In a suit brought by A. P. Post to recover the amount of several coupons on bonds issued by Mason County, Ill., in aid of this road (then known as the Havana, Mason City, Lincoln & Eastern), the United States Circuit Court has given a judgment for the plaintiff. The defense claimed that the bonds were illegally issued, but the Court overruled the demurrer, and the jury simply passed upon the amount due.

**Cheshire.**—This company is now laying steel rails, and when the rails now on hand are down there will be only seven miles of iron track left in the main line. A heavy mogul engine has been ordered and will be used to work the steep grades between Walpole, N. H., and Westmoreland.



**Chicago & Hannibal & St. Joseph.**—This company has filed articles of incorporation in Illinois to build a railroad from Quincy to Chicago by the shortest practicable line. The incorporators are Wm. Dowd, Jay Gould, Russell Sage, Myron P. Bush, Sidney Dillon and Elihu Root of New York; John B. Lyon, Charles B. Farwell, George C. Walker and Samuel J. Medill of Chicago; John B. Carson and James W. Singleton of Quincy; most of them are connected with the Hannibal & St. Joseph road, which the new line is to extend to Chicago.

It is given out that the road is to be built at once, and that a contract has been made by which the new road is to have the Chicago business of the Missouri, Kansas & Texas. That road is to be connected with the Hannibal & St. Joseph by a short spur, a quarter of a mile long, at Monroe, Mo., 22 miles from Hannibal by the Missouri, Kansas & Texas, and 15 miles west of Palmyra Junction, where the Quincy Branch of the Hannibal & St. Joseph leaves the main line.

**Chicago & Indiana State Line.**—This company has filed articles of incorporation to build a railroad from the Chicago & Alton, near the point where that road crosses the South Branch, southeast to the Union Stock Yards, and thence to a junction with the Pittsburgh, F. Wayne a Chicago near the Indiana state line. It is understood that the purpose is to build at present only the section from the Chicago & Alton to the Union Stock Yards. The capital stock is fixed at \$200,000, and the incorporators are James W. Walker, John Newell, John B. Sherman, Irus Coy, George T. Williams and L. O. Giddard, of Chicago, and Nathaniel Thayer, Jr., of Boston.

**Chicago & Iowa.**—There is a report that the Hinckley party is trying to sell out its interest in this road to the Chicago, Milwaukee & St. Paul Company, but the indications are that it is the Chicago, Rockford & Northern that it wants. It would have to build some 26 miles of road close to existing lines in order to use the Chicago & Iowa to advantage, by a connection at its eastern end at Aurora.

**Chicago & Northwestern.**—The Dakota Central line of this road was opened for business July 12 to Huron, Dakota, on the James River. Rates on freight to this point from lake ports (Chicago, Kenosha, Racine and Milwaukee) for the five numbered classes, \$1.40, \$1.30, 95 cents, 75 and 52 cents per 100 lbs., respectively; for salt, cement and plaster, 32 cents; and for live stock per car-load, \$100 for horses and mules, \$90 for cattle and hogs, and \$75 for sheep in single-deck cars. Huron is 37 miles beyond the late terminus at De Smet, and 140 miles from the Winona & St. Peter at Tracy.

Work has been begun on the extension of the recently purchased Chicago & Tomah line from Montpoint, Wis., to Madison, and a large force is now employed.

It is said that work will soon be begun on the proposed new line from Milwaukee to Madison, to be built and owned by this company.

The Chicago & Dakota line, above referred to, is now nearly all graded from the new terminus at Huron westward 110 miles to Ft. Pierre on the Missouri River. From Ft. Pierre to Deadwood in the Black Hills is 150 miles in an air line, or about 180 miles by the stage road. The company has now nearly finished grading a branch from Huron north up the James (or Dakota) River to Columbia in Brown County, a distance of 90 miles, on which the rails will be laid at once.

Work is progressing on the extension westward of the Toledo & Northwestern line, which is reported nearly finished to the crossing of the Des Moines Division near Callanan.

The company is reported to be securing the right of way for a line about 59 miles long from Watertown, Dak., on the Winona & St. Peter line to Volga on the Chicago & Dakota line, through the Big Sioux valley.

**Chicago & South Atlantic.**—An application was made last week in the United States Circuit Court in Chicago for the appointment of a receiver for the property of this company. The application was made by parties holding judgments against the company. After argument, the Court laid the matter over in order to ascertain the standing of a similar proceeding in the Illinois Circuit Court.

The company was organized in 1873 to build a road from Chicago to Savannah. It has never completed any road and has very little property of any kind.

**Chicago, Milwaukee & St. Paul.**—This company has let a contract to O'Hara & Brother, of Cedar Rapids, Ia., to build an extension of its Monroe Branch from Monroe, Wis., west to Gratiot. This is a commencement of the extension west to a connection with the Mineral Point Railroad. The section now let includes a large quantity of rock excavation.

**Chicago, Rock Island & Pacific.**—This company has located its new line from Davenport, Ia., to Muscatine, following the general course of the Mississippi. It is 27 miles long, 11 miles shorter than the present road by way of Wilton. Work is to be begun at once, with the intention of completing it by November next.

**Chicago, St. Paul, Minneapolis & Omaha.**—Work is progressing on the grading of the extension of this company's line in Nebraska toward Sioux City. Some trouble has arisen with the Union Pacific over the right of way near Norfolk, both companies claiming the prior right.

**Cincinnati & Portsmouth.**—The Ohio Court of Common Pleas has granted an order for the sale of this road for the benefit of the creditors. The chief claimants are the contractors, who have lately secured a heavy judgment against the company. The road is in operation from Columbia, O., to Cleveland, 21 miles, and some work has been done on the road besides.

**Cleveland & Marietta.**—The stockholders of this company (successor to the Marietta, Pittsburgh & Cleveland) have voted to authorize an issue of \$1,000,000 bonds for the purpose of making necessary improvements on the road and of building an extension of 24 miles from Canal Dover, O., to Canton, to connect with the Valley Railroad. This extension will complete a line nearly due north from Marietta, O., to Cleveland, 181 miles long, a large part of which is through valuable coal lands.

**Columbus, Chicago & Indiana Central.**—The Master appointed on the intervening petition of Wilson and others, has made a report to the Court. The petition was to secure payment for the right of way of the branch between Logansport and State Line. This right of way was taken nearly 20 years ago, when the land was worth little, and has never been paid for. The claims were referred to a master, who now reports that the company is a mere trespasser, and that nothing short of occupancy for twenty years, which the company had not enjoyed, will give a title under such circumstances. He is, therefore, of the opinion, that the intervenors are, every one, entitled to compensation for whatever damage has been done to his land by reason of the construction and operation of the railroad. The Master says an embarrassing question arises as to the meas-

ure of damages to be awarded: whether it shall be the value of the land at the time of the trespass, or the present value, together with that of all the improvements made upon the right of way, station-houses, elevators, etc., which petitioners claim. To the Master this appears inequitable, and yet it appears to be law in Indiana. He makes no finding upon the law in the case, but presents a tabulated statement of the amount of damages to which the petitioners would be entitled under each view of the case, i. e., at the time the railroad was constructed (including consequential damages to the entire track, as well as the mere right of way) and at the present time. There are 47 claims for damages, covering almost 50 miles of the road, which aggregate as follows: Total value at the time of appropriation, \$15,872.37; present value, \$47,371.82.

**Connoton Northern.**—This company, which purposes extending the Connoton Valley road from Canton, O., to Lake Erie, will build directly the section of 10 miles from Canton northward. From the ends of this first section to Kent, 16 miles, a contract has been let to Strong & Carey, of Cleveland, who have already begun work. A third section of 14 miles will soon be let, from Kent north to Pond station on the Mahoning Division of the New York, Pennsylvania & Ohio road, 20 miles from Cleveland, where connections will be made for that city.

**Council Bluffs & Eastern.**—This company has filed articles of incorporation to build a railroad from Council Bluffs, Ia., east to the Mississippi River by the shortest possible route.

**Credit Valley.**—On July 7 the employés of this road refused to work longer, having received no pay for several months. On the same day a receiver was appointed. The road has been under construction for at least five years, but has been in operation only about a year. It was built chiefly by municipal bonuses, and has a large floating debt. It is now in operation from Toronto, Ont., to Ingersoll, 95 miles, with branches from Streetsville to Orangeville, 36 miles, and from Church's Falls to Elora, 28 miles. It runs through a district already pretty well supplied with railroads.

**Denver & Rio Grande.**—This company's line into New Mexico has been completed and opened for business to Tres Piedras, N. M., 64 miles southward from the late terminus at Alamosa, Col., 194 miles from South Pueblo, and 314 miles from Denver. The new terminus is about 60 miles from Santa Fe.

The San Juan Extension is so far advanced that the company hopes to have trains running by August to Chama, 50 miles west from the junction with the New Mexico line at San Antonio.

The short branch line from Colorado Springs to Manitou is nearly finished, and will probably be ready for business this month. There is an unusual number of visitors to Manitou this year.

For the week ending July 10 this road brought 354 carloads of freight to Denver, more than any other line, and about one-third of the whole number received.

**Framingham & Lowell.**—The Boston Advertiser of June 16 says: "This company, which defaulted its interest upon the first mortgage bonds in Oct. 1, 1879, and April 1, 1880, is now paying the past-due coupons at the National Hide & Leather Bank, Boston, the October coupon at 7 per cent, and the April coupon at 5 per cent. The railroad and property have been leased to the Old Colony Railroad for 999 years, and the interest upon the first mortgage bonds is guaranteed at the rate of 5 per cent, and will be paid at the Treasurer's office of the Old Colony Railroad from and after Oct. 1, 1880. The coupon notes of the company which are deposited at the International Trust Company, 45 Milk street, Boston, on or before Aug. 10, 1880, will be entitled to the benefits of the new financial arrangement, and will receive the surplus earnings, after paying interest on the first mortgage bonds. New preferred stock is to be issued to represent the said coupon notes."

**Grand Southern.**—The New Brunswick Circuit Court has granted an injunction restraining the Carleton Branch Company from rescinding the lease of its road to this company, or from preventing it from making connections with the branch, or from using its track.

**Greenville & Columbia.**—A dispatch from Charleston, S. C., July 15, says: "The purchasers of the Greenville & Columbia Railroad at the auction sale in April last, have filed a petition in the State Court claiming that the road was knocked down to them at \$2,393,600, and that the bids subsequently received were irregular, not bona fide, and therefore void. They pray that they be adjudged entitled to take the road at that price, which was the highest legal bid. Upon this petition, verified by affidavits, application was made to Judge Hudson for a stay of proceedings, and an order was entered to-day suspending all proceedings in regard to compliance with the terms of sale for 20 days, and the case will come up for a hearing during the present term of court."

**Gulf, Colorado & Santa Fe.**—This company is surveying a branch from a point on its line in Bell County, Tex., to Cleburne in Johnson County. The survey passes through the western part of McLennan County, near Comanche Spring, and crosses the Bosque River six miles below the town of Clifton. Thence it passes up the Bosque valley some eight miles; thence up the Archibald Branch to the Bald Knob; thence along the heads of Cedron Creek to the head of Loggit Branch; thence down the same, crossing Steel's Creek and the track of the Texas Central Railroad, 2½ miles east of the town of Morgan; thence north to the Brazos River, about two miles below Kimball, and thence up Nolan's River to Cleburne.

**Guatemala Railroad.**—A telegram from Panama, dated July 6, says: "The presidents of Salvador and Honduras had gone to Guatemala to be present with President Barrios at the opening to traffic of the Guatemala Railroad, which event took place on the 19th of June, and was celebrated with great *clat*. The road is from the port of San Jose on the Pacific to the town of Escuintla, about 30 miles inland, on the road to the capital, and nearly half way."

**Jeffersonville, Madison & Indianapolis.**—Negotiations are said to be in progress for an agreement by which the Pennsylvania Company, lessee, may temporarily suspend the payment of the dividends on the stock, payable according to the terms of the lease. If the stockholders agree, the lessee will apply the earnings of the road to laying steel rails and making other necessary improvements and additions to the present facilities for handling business.

**Laramie, North Park & Pacific.**—This company has been organized to build a railroad from the Union Pacific at Laramie, Wyoming, by way of the North Park, Muddy Pass and Grand River to Breckenridge, Col., about 140 miles. Several branches are also projected to the Bear River and Eagle River country, to Gunnison and other points, one to run westward to the Utah line.

**Little Rock, Mississippi River & Texas.**—The grading of the extension of this road to Little Rock is completed from Pine Bluff, Ark., northwest 10 miles, and track-laying is to be begun at once. The work is to be pushed, and the company hopes to have trains running to Little Rock before winter.

**Long Island.**—Mr. Wm. J. Nicolls, Engineer of this road, is making surveys from Locust Valley, N. Y., east to Oyster Bay, with the view of extending the Glen Cove Branch to the latter place. The distance is about four miles.

**Louisville & Nashville.**—The Louisville Courier-Journal announces that this company has negotiated, through Drexel, Morgan & Co., of New York, and Baring Brothers & Co., of London, for the sale of \$20,000,000 of its bonds, having 50 years to run, at 6 per cent.; \$10,000,000 of this amount is intended to take up and retire all bonds now outstanding under its several existing mortgages. A general mortgage for the \$20,000,000 is now being recorded in the several counties through which the road passes.

**Manhattan Elevated.**—The directors of this company and its leased lines, the New York and the Metropolitan Elevated, have been in consultation for several days. It is understood that an effort is being made to abrogate the present leases, and arrange a consolidation of the three companies, but up to date no agreement has been reached.

**Missouri, Iowa & Nebraska.**—The Centreville, Moravia & Albia Branch of this road is now completed, from Centreville, Ia., northward to Moravia, about 10 miles, leaving 11 miles to be finished to reach Albia. The Chicago, Burlington & Quincy, we believe, has partly completed a branch covering the same ground.

**Morgan's Louisiana & Texas.**—This company has completed a new transfer boat capable of carrying a locomotive and 15 cars. It has also built new ferry slips on the levee in New Orleans, and trains can now be transferred across the river from the railroad terminus in Algiers to New Orleans without the delay formerly required.

**New Brunswick.**—The round-house of this road at Caribou, Me., was destroyed by fire on July 19, with two engines, several cars and other property. The loss is estimated at \$25,000.

**New Orleans Pacific.**—The New Orleans Picayune of July 17 says: "Telegrams from President Wheelock state that the contract with the Construction Company was signed in New York yesterday morning. A railway from New Orleans to Marshall via Alexandria is now secured beyond a doubt."

"The terms of the contract were arranged a few weeks since at a conference held in this city between the directors of the New Orleans Pacific Railroad Company and ex-Gov. Brown, James P. Scott, and others representing Messrs. Jay Gould and Tom Scott."

"The latter parties were to organize a construction company which should build and equip the road from this city to Marshall at a certain sum per mile, to be paid in first mortgage bonds and stock of the New Orleans Pacific Company; the bonds and stock to be delivered on the completion of sections of 10 miles."

"This Construction Company was subjected to some unexpected delays in raising the necessary capital in New York, one of which was the necessity of advertising its charter in that city for 30 days to give it a legal existence."

"But all necessary preliminaries have been arranged, the capital to perform the work has been subscribed, and the final documents signed and delivered. The company agrees to complete the road ready for business in 18 months. It will probably be done earlier."

"The route is such as to afford extraordinary facilities for speedy construction. Work can be commenced on the trans-Mississippi Division, and conducted both ways at Alexandria, and from the Atchafalaya crossing."

"It is not yet known what route will be followed after reaching Brule Landing. If the Mississippi is crossed there, work can be conducted with equal advantage from both Baton Rouge and New Orleans. Some 90 miles of the track are already graded and the country on this side the Mississippi, between here and Baton Rouge, along the river bank, is favorable for railway construction. In fact, it presents the cheapest and best route out of this city."

"By the terms of the agreement with the Construction Company, the present directors of the New Orleans Pacific Railroad Company will lose control when a majority of the stock shall have been transferred to the former. This will occur after some 40 miles of the track shall have been completed. But provisions have been made to insure local representation to the extent of the financial interest of our citizens, and this was all that could be expected."

**New Seaboard Pipe Line.**—Describing the oil-pipe line now being pushed toward the seaboard, the Hornellsville Times says: "Its beginning is near Bradford. It pursues a straight line to the east that, if continued, will bring it out near Catskill, on the Hudson River. It may bend to the southeast to strike water at New York. It is generally considered that this line is intended to convey oil to the seaboard, or some river convenient thereto. By whom it is being pushed through is a puzzle. Report says the project is advanced by the Union Tank Line Company. This is undoubtedly a branch or only another name for the Standard Oil Company. The cost of the undertaking cannot be estimated, but that it is a gigantic enterprise and will cost a vast sum may be easily shown. The tanks at Cameron Mills will cost nearly \$10,000. Each of the pumps will weigh 65 tons, and will cost \$16,000 or more. The engines will consume five to ten tons of coal per day. The pipe is wrought iron and costs \$1.20 a foot. Add the cost of surveying, clearing away, laying the pipe, burying it, engine buildings and a score of other things, and the expenditure, were it known, would seem fabulous. A new telegraph wire has been put up along the line, and a report of progress at various points is daily wired to headquarters. When the line is in operation a full report of the business at each station will daily be telegraphed to the proper officials. Every length of pipe is numbered, and is checked off when put on and taken off the cars. It is receipted for by the teamster and again by the men who lay it. Every detail in this great scheme is watched and properly recorded and reported."

**New York & New England.**—The Massachusetts Supreme Court has decided that the "Berdell" bonds of the Boston, Hartford & Erie are exchangeable for stock in the New York & New England Company after some of the interest coupons have been paid. The bonds in suit are of the issue of \$5,000,000 guaranteed by the Erie. The defendant claimed that it was not required to issue stock on bonds where the coupons had in part been paid. The rescript of the decision is as follows:

"The present holders of the interest warrant detached from the bonds of the plaintiffs have the rights only which the Erie Railway Company would have. The Erie Railway Company, having guaranteed the payment to the plaintiff of these interest warrants, cannot be regarded as purchasers of the interest warrants as against the plaintiffs, and are not



entitled as against them to share in the proceeds of the mortgage security. The defendant is required to issue certificates of stock to the plaintiffs to the full amount of the principal sums of their bonds at the rate of ten shares for every \$1,000."

**New York Central & Hudson River.**—We are informed that this company has at last adopted the Westinghouse Automatic air-brake, and has given orders to the Westinghouse Air-Brake Company for the equipment of its passenger trains with that brake—a fact on which the railroad company and its patrons are both to be congratulated. It is almost the last of the great railroads in this country to adopt an air or vacuum brake.

The company has recently constructed in its shops at West Albany 28 new passenger cars for local traffic, very much superior to anything that has been on the road heretofore. Indeed, as we have frequently shown, the passenger traffic on this road has been substantially stationary for many years, and one of the consequences has been that there has been no increase in passenger equipment; even in the Centennial year there was none, and yet the stock on hand was generally sufficient in capacity. It has become decidedly antiquated, however, and the new cars make a striking contrast to some of the old ones. They are especially designed for local traffic, and have some general resemblance to the cars of the Metropolitan Elevated road in New York, in this, that at each end the seats are arranged as in a horse car, facing the central aisle, while in the middle of the car are the ordinary seats for two facing the ends of the car. Unlike the Elevated Railroad cars, however, these middle seats are reversible, as in ordinary cars. There are also more of them, for the car is 64 ft. long, with seats for 64 passengers, while the elevated cars seat but 48. The new cars are finished in mahogany, with plate-glass windows, 22 x 30 in., and they have the close-woven cane seats that are becoming so popular, and are so comfortable, and easy to keep clean. There is one novel feature about these seats, however. Although of cane, backed with canvas, like other cane car seats, they have springs also, and are, so far as we know, the first spring cane seats that ever were made.

Sixteen of these new cars are to run on the suburban trains between New York and Tarrytown (they are not all out of the shops yet), and 12 on the western end of the road. The passenger traffic of the road has increased very largely of late months.

**Ogdensburg & Lake Champlain.**—This company will issue certificates of first consolidated mortgage bonds to the amount of 70 per cent. of its preferred stock and income mortgage bonds for 50 per cent. thereof (including accrued dividends to Oct. 1, 1880), upon surrender and cancellation of certificates for said stock. The option of making this exchange will terminate Oct. 1 next. The exchange can be made at the office in Boston.

**Oxford & Henderson.**—This company has accepted a proposition from the Raleigh & Gaston Company to build and equip the line. Work will be begun as soon as the contract can be approved and signed. The line is from Henderson, N. C., on the Raleigh & Gaston road, west to Oxford, about 14 miles.

**Pensacola & Selma.**—The contractors, Callahan & Dunnivant, have stopped work on the extension of this road, refusing to recognize the transfer to the Louisville & Nashville Company. They have entered suit against D. F. Sullivan, the former owner of the road, on what grounds is not very clear.

**Philadelphia & Reading.**—After omitting the April statement the Receivers have resumed the publication of monthly reports of earnings. That for May and the six months of the fiscal year from Dec. 1 to May 31 is as follows:

	Month.	1880.	1879.	Six months.	1880.	1879.
Gross earnings:						
Railroad traffic:	\$1,307,148	\$1,144,051	\$7,621,922	\$5,559,182		
Canal traffic:	98,941	101,809	248,154	235,973		
Steam coilers:	43,408	63,106	315,352	344,110		
Richmond barges:	8,295	23,524	48,091	64,345		
Total R. R. Co.	\$1,457,882	\$1,332,547	\$8,233,519	\$6,233,310		
Coal & Iron Co.	1,227,141	1,015,641	5,254,329	4,184,701		
Total.	\$2,685,023	\$2,348,188	\$13,487,848	\$10,418,011		
Traffic:						
Passengers carried:	839,548	649,941	4,448,070	3,143,956		
Tons merchandise:	528,129	459,317	2,980,210	1,852,282		
Tons coal:	520,299	828,322	3,207,070	3,480,004		
Tons coal on colliers:	47,396	50,039	265,004	291,474		
Tons coal mined:						
By Coal & Iron Co.	247,777	418,643	1,543,219	1,797,298		
By tenants:	89,923	127,592	520,110	556,214		
Total.	337,700	546,235	2,063,329	2,353,512		

In addition to this, the Receivers publish a supplementary statement showing net as well as gross earnings. In this statement, given below, the expenses include rentals of leased lines and canals, as well as working expenses:

	May.	1880.	1879.	Six months.	1880.	1879.
Gross earnings:	\$1,457,882	\$1,332,547	\$8,233,519	\$6,233,310		
Gross expenses:	1,201,646	1,046,255	6,463,753	4,773,821		
Net profit:	\$256,236	\$286,292	\$1,769,766	\$1,459,489		
Coal and Iron Co.:						
Gross earnings:	\$1,227,141	1,015,641	5,254,329	4,184,701		
Gross expenses:	1,215,505	1,070,339	5,418,528	4,511,862		
Net loss:	\$11,636	\$54,698	\$164,199	\$327,161		
Total net profit, both companies:	\$267,872	\$231,594	\$1,605,567	\$1,132,328		

\* Profit.

It will be seen that the great increase in net earnings which the railroad company has been reporting this year stands for a comparatively smaller gain in net profits. For the six months the gross receipts of the railroad company increased \$2,000,209, or 32.1 per cent., and those of both companies combined, \$3,069,837, or 29.4 per cent. In the same period the net profits of the Railroad Company increased \$310,277, or 21.8 per cent.; the Coal & Iron Company's deficit was only about half of last year's, bringing up the combined net profit gained \$473,239, or 41.8 per cent.

The *North American* of July 19 says: "The effects of the Reading Railroad Company are being appraised as rapidly as possible. The personal property, consisting of rolling-stock, materials on hand and furniture, have been appraised by the heads of the various departments, but the value of the real estate and road-bed will be estimated by other parties. In appraising the real estate, the services of competent judges, generally real estate agents located in or near the place to be valued, have been engaged. The entire work is under the supervision of a Board of Appraisers, consisting of J. E. Wooten, General Manager; William Lorenz, Chief Engineer, and J. Lowrie Bell, General Traffic Manager. These gentlemen will to-day start upon a tour of inspection

of the property, in order to be able to pass intelligently upon the estimates to be submitted to them. When this has been completed, the result of their labors will be sent to the Board of Receivers, and by them to the Court, as directed in its order granting the receivership. The appraisement will be completed about Aug. 15. The valuations of the property of the Coal & Iron Company, which are submitted directly to Messrs. Gowen, Lewis and Caldwell, are nearly complete, but it is probable that they will not be made public until the Railroad Company's property has been appraised."

**Port Huron & Northwestern.**—Mr. A. L. Reed, Chief Engineer, writes us as follows, under date of July 17: "Our road has up to present date extended its track to Minden, near the north line of Sanilac County, an extension of 19 miles since my last report. The road-bed is nearly ready for the iron to Sand Beach, Huron County, 14½ miles further. We have also commenced the construction of the Marlette Branch, leaving the main line at Balmer's station, 13 miles out, and extending to Marlette, Sanilac County, a distance of 32 miles. Both main line and branch will be pushed to an early completion." The road is now 56 miles long, from Port Huron, Mich., to Minden.

**St. Paul, Minneapolis & Manitoba.**—The St. Paul Pioneer-Press of July 16 says: "The agreement entered into some months since between the Minneapolis & Northwestern (narrow gauge) and St. Paul, Minneapolis & Manitoba companies, by which the latter swallows the former, was fully carried out and consummated in this city yesterday, General Manager Hill and R. B. Galusha visiting the city for that purpose. The papers were signed, sealed and delivered, and the money paid over by Mr. Hill. The substance of this agreement was given when originally made, but it will bear repetition. The stockholders of the narrow-gauge company had subscribed for \$150,000 of the stock, 10 per cent. of which they had paid in. They had also contracted for a quantity of iron and incurred other liabilities. The St. Paul, Minneapolis & Manitoba Company assumes all the liabilities, and refunds to the stockholders 7 of the 10 per cent. they have paid in. Further, the St. Paul, Minneapolis & Manitoba agrees to construct the two bridges and the union depot in Minneapolis, and build 100 miles of standard-gauge road northwesterly from Minneapolis, substantially upon the route of the proposed narrow gauge, for a bonus of \$1,000 per mile from the city, and there the responsibility of the city ends. Ten miles of this road is to be built this year, 40 miles next year, and the remaining 60 miles before Jan. 1, 1884.

All of which is entirely satisfactory to Minneapolis, and the St. Paul, Minneapolis & Manitoba Company are actively preparing to carry out their portion of the contract."

**Scioto Valley.**—The stockholders of this company have voted to increase the capital \$500,000, and to proceed at once with the extension from Portsmouth, Ohio, up the Ohio River to a point opposite Ashland, Ky., to connect with the Chesapeake & Ohio road, which is expected to reach Ashland this fall.

**Springfield & Northeastern.**—At the special meeting in Springfield, Mass., July 17, the stockholders voted unanimously to ratify the sale of the road to the Boston & Albany Company for \$450,000. The purchasing company will take possession about Aug. 1, and the road will then be known as the Athol Division of the Boston & Albany.

**Texas & Pacific.**—Track on this road has reached to Brazos River crossing, 57 miles west from Ft. Worth, Tex., and 26 miles beyond Weatherford, to which point trains now run regularly. A temporary trestle-bridge has been built across the Brazos, on which construction trains cross, and preparations are being made to put up the permanent bridge, which will have three spans, 250 ft. each, of Warren combination truss, and 332 ft. of pile bridge at the east end. The track follows the Brazos for six miles, at one point going through a side-hill cut in rock and at another crossing a branch on a pile-bridge 750 ft. long. The graders are at work 60 miles beyond the end of the track.

**Toledo, Peoria & Warsaw.**—Certain creditors, who presented an intervening petition in the foreclosure suit, have obtained leave from Judge Drummond, of the United States Circuit Court, to file a bill in the Circuit Court of Peoria County against the Toledo, Peoria & Warsaw Railway Company, now in the hands of A. Lawrence Hopkins, Receiver. The petition presented to Judge Drummond for leave to sue sets forth in substance that, at the time of commencing the foreclosure proceedings by Secor and others, the Toledo, Peoria & Warsaw Railway Company was greatly encumbered by mortgages to secure the payment of its bonds, and, being insolvent and unable to pay the semi-annual interest on its bonds, the stock and bondholders, and other creditors of the corporation, agreed upon a plan of sale and reorganization of the company. That the first and second preferred and common stockholders of the old company agreed to deliver to the purchasing committee all the stock held by them respectively, and upon purchase of the old road and conveyance thereof to the new Toledo, Peoria & Warsaw Railroad Company, the stockholders of the old company were entitled to receive in exchange for their stock as follows: The holders of the first preferred, 50; of the second preferred, 30, and of the common stock, 25 per cent. of the par thereof, in certificates of the income mortgage of the new company.

The object of the bill is to subject this stock, which the stockholders of the old corporation are entitled to receive under the agreement, to the payment of the debts of the corporation, on the ground that the stockholders are not entitled to any share of the capital stock until the debts of the corporation are paid. The amount due the unsatisfied judgment claimants is about \$40,000. The point presented is an interesting one, as the road has been sold under the agreement, and the Receiver is about ready to turn over all the property of the old company to the new one.

It is announced that a lease or agreement has been concluded under which the trains of this road will have the use of the Cincinnati, LaFayette & Chicago track from Sheldon, Ill., to LaFayette, Ind., 46 miles. The rental is to be equivalent to one-half the cost of maintenance and one-half the interest on the cost of the road. The lease is to the Wabash, St. Louis & Pacific Company, which controls this road. For some years a good deal of business has been exchanged with the Wabash over this line, but under the new agreement the Toledo, Peoria & Warsaw trains are to run through to LaFayette. This looks as if there was not an intention to carry out the proposed lease of the Columbus, Chicago & Indiana Central branch from Logansport to State Line.

**Troy & Greenfield.**—Mr. G. Clinton Gardner, Manager of this road, writes us under date of July 17 as follows: "The *Railroad Gazette*, usually very correct in its statements, seems to have been wide of the mark when it stated that the wash-out of last Saturday night stopped all freight and necessitated the transfer of passengers for three days. Passengers were transferred between one and two o'clock Sunday noon and all freight was moving Sunday night.

It is correct that there was no damage done to the tunnel, but the rock bank at the west end of Deerfield bridge was washed out and the entire bank east of there for 60 or 80 feet taken out, with slight washes for a distance of over half a mile. I was quite satisfied with the promptness of re-

pair, and His Excellency the Governor seems to have been also, as he requested me to extend to Assistant Engineer Locke, who is in charge of the Maintenance of Way Department, his hearty congratulations upon the prudence and care by which all accidents were avoided during the freshet and upon the promptness with which the road was restored to running order."

**Wabash, St. Louis & Pacific.**—It is reported that this company has made arrangements for the use of the Columbus, Chicago & Indiana Central tracks into Chicago for freight business, the contract being temporary in its nature and only to continue until the troubles of the Chicago & Western Indiana are settled.

The lease of the Cincinnati, La Fayette & Chicago track as a connection with the Toledo, Peoria & Warsaw is noted elsewhere.

In the United States Circuit Court in Indianapolis, July 14, an order was made reinstating the case of David J. Tysen, Jr., Benjamin F. Ham, et al., vs. the Wabash Railroad Company, which was dismissed through an error some time ago. The plaintiffs are, besides those named, Edward De Rose, Henry A. Mott, John W. Fendron, Charles Jackson, G. M. Whittemore, Townsend Underhill and Thomas Mayo. They own and hold \$113,000 of an issue of \$800,000 equipment bonds made in 1862 by the Toledo & Wabash Company, and ask that the officers and trustees of the defendant companies be required to exchange therefor a like amount of the consolidated mortgage bonds of 1873, and pay the interest on the equipment bonds due since Nov. 1874.

It is announced that the \$2,000,000 new consolidated bonds have been awarded to M. K. Jesup, Paton & Co., of New York, at a price not stated. Bids received amounted to over \$7,000,000.

**Watchung.**—Arrangements have been made to operate this road once more. It was built about seven years ago, but has been worked but a few months in all that time. It is about four miles long, extending from Woodside Park, N. J., on the New York & Greenwood Lake road, to West Orange. Considerable work is to be done to put the road in order; the ditches must be cleared out, ballasting done, bridges repaired, and one long trestle, which is badly decayed, either rebuilt or filled in. Arrangements have also been made for an extension of about half a mile on the West Orange end, which will bring it to a more central and convenient terminus, and for the building of a handsome and convenient depot there. The whole cost is estimated at \$80,000, which is probably quite as much as it cost to build the road in the first place.

**Western Maryland.**—This road is doing a very large excursion business this season from Baltimore to Pennmar and other points in the mountain region on the line. There has also been a considerable business in the way of excursions from the towns on the line to Baltimore.

## ANNUAL REPORTS.

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## Boston & New York Air Line.

This company, successor through foreclosure to the New Haven, Middletown & Willimantic, owns a line from Willimantic, Conn., to Cedar Hill Junction in New Haven, 50 miles, and leases the Colchester road, a branch 3½ miles long to Colchester. It uses the New York, New Haven and Hartford track from Cedar Hill Junction into New Haven, two and a half miles. Its report is for the year ending April 30, 1880. The road is now worked under a pooling contract with the New York, New Haven & Hartford Company, under which this company receives 6 per cent. of the gross earnings of both roads.

The balance sheet is as follows:

Stock account (\$70,630 per mile).....	\$3,831,527.28
Bonds (\$10,000 per mile).....	509,600.00
Current accounts.....	19,131.07
Profit and loss.....	128,390.24
Total.....	\$4,479,048.59
Road & equipmt. (\$88,850 per mile).....	\$4,441,491.20
Materials.....	7,757.13
Cash and receivables.....	29,800.26
Total.....	4,479,048.59

The stock account is made up of \$2,767,505 preferred



stock; \$803,800 common stock; \$27,727.28 scrip, and \$232,500 New Haven, Middletown & Willimantic bonds outstanding but not yet converted into stock.

The earnings were as follows, the pooling contract having been in effect from Feb. 1, 1879, three months of the preceding and the whole of the last fiscal year:

	1879-80.	1878-79.	Inc. or Dec.	P. c.
Gross earnings	\$274,177.58	\$276,844.46	I. \$2,666.88	2.4
Expenses	125,537.63	178,870.12	D. 53,332.49	29.8
Net earnings	\$148,639.95	\$98,774.34	I. \$50,865.61	67.4
Gross earn. per mile	4,803.03	4,773.37	I. 29.66	2.4
Net " "	2,654.29	1,585.93	I. 1,068.36	67.4
Per cent. of exps.	45.78	64.83	D. 21.05	31.5

The pooling contract relieved the company of heavy terminal charges at New Haven, and also of the cost of through trains, it being restricted to local business by the contract.

The income account was as follows:

Net earnings, as above	\$148,639.95
Interest on bonds	\$35,000.00
Back taxes	29,063.81
Floating debt paid off	30,175.61
New construction and equipment	41,787.93
	130,027.39

Surplus for the year \$12,012.56

The report says: "During the past year 500 tons of new steel rails have been laid on the road, the Middletown bridges have been completed, and the last of the old wooden trestles has been replaced by solid filling."

"The contract with the New York, New Haven & Hartford Railroad Company, which was ratified by you at your last annual meeting, has also been ratified by the stockholders of the New York & New Haven Company, at their annual meeting held last January."

"The operation of that contract has given entire satisfaction. Your management believe that the percentage of this company, which may be readjusted on Oct. 1 next, will be fixed at a rate at least as favorable as the present rate for the next five years."

"The net earnings of the past year would have justified the payment of a dividend on the preferred stock of this company. Your management, however, have thought it better policy to extinguish the floating debt, and to apply the earnings to permanent betterments of your property. With a renewal of our percentage of the gross earnings of the New York & New Haven Company, at the rate now existing, our net earnings for the next five years will doubtless be at least equal to those of the past year."

#### Utica & Black River.

This company owns a line from Utica, N. Y., to Philadelphia, 87 miles. It leases the Carthage, Watertown & Sackett's Harbor, a branch from Carthage to Sackett's Harbor, 30 miles; the Clayton & Theresa, a branch to Clayton on the St. Lawrence, 16 miles; the Black River & Morristown, which extends the main line to Morristown, 37 miles, and the Ogdensburg & Morristown, which extends it 10 miles further, to Ogdensburg, making 180 miles worked. The fiscal year is that ending Sept. 30.

The Ogdensburg & Morristown is substantially owned, the lessee holding nearly all the stock; the Carthage, Watertown & Sackett's Harbor is leased for 37½ per cent. of gross earnings, and the other roads for the interest on their bonds.

The equipment consists of 18 locomotives; 23 passenger and 10 baggage cars; 210 freight cars.

The general account is as follows, condensed:

Stock (\$20,305 per mile)	\$1,771,720.00
Bonds (\$12,872 per mile)	1,117,000.00
Accounts and balances	54,735.50
Surplus fund	180,750.54
Total	\$3,110,206.04
Road and equipment (\$32,150 per mile)	\$2,797,580.11
Less: lines, stocks, bonds and advances	301,103.87
Cash and receivables	20,450.06
	3,110,206.04

Of the surplus fund above \$160,486.98 is represented by advances to leased lines and to construction account.

The earnings for the year were as follows:

	1878-79.	1877-78.	Inc. or Dec.	P. c.
Passengers	\$180,850.63	\$183,316.33	I. \$2,465.70	4.2
Freight	259,590.90	248,461.48	I. 11,129.42	4.5
Other sources	25,051.81	21,307.11	I. 3,744.70	18.5

Total	\$475,508.34	\$453,144.92	I. \$22,363.42	4.9
Expenses	290,531.71	213,852.02	I. 76,679.69	35.8

Net earnings	\$184,976.63	\$239,292.90	D. \$54,316.27	29.7
Gross earn. per mile	2,652.82	2,649.97	I. 2.85	
Net " "	1,027.65	1,399.37	D. 371.72	26.7
Per cent. of exps.	61.12	47.19	I. 13.93	29.6

The income account for the year was as follows:

Net earnings, as above	\$184,976.63
Rents, interest and premium	7,241.20
Total	\$192,217.83

Interest on bonds \$77,840.00

" Clayton & Theresa bonds 14,000.00

" Black River & Morristown bonds 34,050.00

Carthage, W. town & Sackett's Harbor, proportion of earn. 18,516.94

Dividend, 2 per cent. 35,416.00

Surplus for the year \$11,794.80

Balance from previous year 168,955.65

Total balance of income \$180,750.54

During the year there was advanced to the Carthage, Watertown & Sackett's Harbor \$3,868.78 to make up the amount needed to pay coupons; to the Clayton & Theresa \$1,574.17 to pay taxes, and to the Black River & Morristown \$6,607.18 for filling trestles and building a new iron bridge.

The report says: "The large increase in the expenditures is occasioned, in great measure, by the following items: The purchase of 1,000 tons of new steel rails, which have been placed in the road; an increase in the quantity of fuel needed to replace the large amount extraordinarily used during the last severe winter, and also the amount expended in clearing the tracks from snow. One other cause of increased expenditure is, that the portion of the road between Redwood and Morristown, about 22 miles, has had to be re-ballasted, owing to the poor material used at the time of its construction. Since the current year's account has been closed, we have placed in the road an additional 500 tons of steel rails, which has been paid for by the exchange of 1,000 tons of old iron rails taken from the track."

"During the year, the Ogdensburg & Morristown Railroad has been completed, and gives promise of being a remunerative addition. The total cost of constructing this road is \$123,419.08, which is \$6,597.81 more than the amount as specified in the report following. This difference is the amount received in cash, donated by the citizens of Ogdensburg, to aid in its construction, and has been so applied, and leaves us with an additional mileage of road 10.67 miles in length, well constructed and in good order, at a cost to us of \$115,821.27."

### LOCOMOTIVE RETURNS, MARCH, 1890.

Master Mechanics of all American railroads are invited to send us their monthly returns for this table.

NAME OF ROAD.	Number of locomotives in service.	Number of miles operated.	MILEAGE.		MILES RUN TO		Average No. of freight cars hauled.	Average cost per freight car per mile, cents.	COST PER MILE IN CENTS FOR							AVERAGE COST OF	
			Total.	Average per engine.	Ton of coal.	Cord of wood.			Pail of oil.	Repairs.	Fuel.	Stores.	Miscellaneous.	Engines, firemen and helpers.	Total.	Coal per ton.	Wood per cord.
Allegheny Valley, River Division	190	30	80,097	2,221	30.76	31.40	21.80	0.808	5.45	8.67	0.52		8.00	15.67			
Low Grade Div.	120	15	44,166	2,508	23.40	18.05	20.70	0.939	5.89	1.07	0.08		5.98	10.22			
Central Pacific, Western Div.	300	31	76,771	2,476	50.40	19.80			6.80	12.03	0.44	0.37	7.45	27.08	6.00	5.00	
Northern & San Pablo Div.	104	27	65,223	2,442	44.83	22.07			7.52	13.71	0.40	0.36	7.56	26.05	6.00	5.00	
Visalia Div.	167	10	26,320	2,632	30.19	22.91			2.12	15.39	0.38	0.08	6.60	24.66	6.00	5.00	
Tulare Div.	170	13	30,839	2,975	34.77	18.25			3.55	17.38	0.48	0.24	7.79	31.97	6.00	5.00	
Los Angeles, San Diego, Yuma & Wilmington Divs.	603	31	88,524	2,856	50.33	16.88			3.04	12.08	0.53	0.21	6.59	22.39	6.00	5.00	
California Pacific Div.	179	15	28,848	2,919	43.98	34.22			3.19	13.85	0.40	0.24	6.59	24.58	6.00	5.00	
Stockton & Copperopolis.	40	16	5,470	1,822	49.84	24.04			1.76	12.93	0.35	0.40	5.99	20.83	6.00	5.00	
Sacramento Div.	119	36	91,252	2,341	25.00	23.08			3.44	12.42	0.30	0.38	5.89	30.51		5.00	
Cleveland & Eastern Ohio.	151	7	21,390	3,047	5.00	20.00			4.45	9.99	0.29	0.14	7.74	31.61		5.00	
Truckee Div.	305	26	61,761	2,471	34.69	32.17	31.01		8.40	16.55	0.41	0.83	8.55	34.38	6.00	5.00	
Humboldt Div.	320	19	51,590	2,731	30.08	26.66			10.25	15.47	0.38	0.39	7.02	34.08	6.00	5.00	
Salt Lake Div.	219	22	74,931	2,508	26.45	18.46			4.39	21.46	0.49	0.39	7.17	32.71	8.00	5.00	
Chicago & Eastern Illinois.	158	38	80,475	2,711	31.01	18.00	85.09		2.33	4.23	0.41		5.90	12.27			
Cin., Ind., St. Louis & Chicago.	245	40	120,216	2,910	33.30	22.02			3.53	6.93	0.22		5.73	16.11			
Cin., La Fayette & Chicago.	75	10	32,477	3,246	27.43	14.55			2.00	8.51	0.34		5.65	16.50			
Cleve., Col. Cin. & Ind.	4	4	417,294	37,635	6.25	24.19			3.54	6.92	0.54		6.79	17.09			
Cleveland & Pittsburgh.	255	63	184,485	2,923	42.03	30.11	17.76	0.805	3.88	3.59	0.46	2.31	6.13	16.95	1.40	8.00	
Cleveland, Tus. Valley & Wheeling.	140	18	48,830	2,718	36.14	18.28			3.49	2.81	0.43		5.67	12.40	0.93	2.00	
Delta, Lacka. & Western, Bloomsburg Div.	80	22	65,515	2,978		31.39			2.17		0.5		4.19	6.86			
Eric & Pittsburgh.	96	25	65,712	2,347	40.57	21.81	16.40	0.976	2.92	5.27	0.42	2.40	6.00	17.19	2.14	2.14	
Grand Rapids & Indiana.	238	4	150,068	3,062	39.97	37.98	19.78		2.66	8.00	0.40	2.85	5.00	18.30	3.40	2.50	
Green Bay & Minnesota.	210	15	41,880	2,760	51.05	30.63	23.41		2.97	7.76	0.30	0.02	4.37	13.64	4.10	2.00	
Houston & Texas Central.	512					15.94	30.34		4.32	4.42	0.30		5.78	14.82	1.40	3.75	
Illinois Central, Chicago Div.	383	95	212,363	2,226	33.74	15.94	30.34		4.32	4.42	0.36		5.78	14.82	1.40	3.75	
Middle Div.	80	7	6,309	914	34.39	13.55	6.82		2.23	4.09	0.34		5.50	12.46	1.40	3.75	
North Div.	345	51	117,094	2,296	31.51	15.82	14.49		4.08	4.65	0.39		5.58	14.56	1.40	3.75	
Springfield Div.	113	18	26,510	2,376	36.09	14.02	14.45		2.53	3.95	0.29		4.49	10.97	1.35	2.90	
Iowa Div.	401	43	110,394	2,703	29.61	15.37	13.89		3.67	7.39	0.27		5.66	17.04	2.00	5.25	
Jeffersonville, Madison & Ind.	226	43	93,643	2,178	41.36	15.12	22.54	0.720	1.68	6.02	0.36	2.00	5.61	15.65	2.30	2.10	
Kan. City, St. Jo. & Council Bluffs.	217	35	105,269	2,574	39.20	33.30	21.70		3.90	7.00	0.30		6.50	17.70	2.90	3.60	
Lake Shore & Mich. So., Buffalo Div.	104	84	19,554	2,321	33.07	67.50	23.95		3.32	8.04	0.30		5.39	17.98	2.80	5.00	
Eric Div.	117	278	72,735	2,387	32.90	27.02			4.48	7.25	0.31		5.86	17.93	2.97	5.48	
Toledo Div.	80	307	70,792	2,384	24.71	70.5	19.21		3.63	10.67	0.37		6.06	20.77	2.67	4.08	
Mich. Southern Div.	307	518	184	2,479	32.00	55.45	22.40		5.24	9.39	0.28		5.95	30.80	3.10	4.93	
Little Rock, Miss. River & Texas.	104	10	10,734			55.50			5.74	3.60	0.32	2.13	8.04	20.38		2.00	
Louisville & Nashville, First Div.	282	60	128,739	2,104	30.53	16.39	17.04	1.290	3.61	6.90	0.38	1.33	4.83	18.85	1.96	3.30	
Second Div.	200	34	81,891	2,419	28.74	11.86	14.69	1.340	5.90	6.54	0.33	1.29	6.17	30.23	1.83	2.55	
Memphis Div.	131	18	44,019	2,447	35.52	16.6	14.08	1.460	4.85	7.67	0.42	1.76	6.79	20.49	2.70	2.00	
Nash. & Decatur Div.	132	21	49,489	2,356	28.91	16.33	14.35	1.240	13.14	6.30	0.37	1.89	6.11	27.30	1.77	2.90	
South & North Alabama.	184	24	91,945	2,765	38.54	14.48	15.01	1.320	4.36	6.45	0.40	1.04	5.99	18.98	1.77	2.90	
Evansville, Hen. & Nash. Div.	135	24	63,176	2,632	34.61	19.35	13.49	1.370	4.50	3.91	0.23	1.50	6.02	16.18	1.83	1.75	
Mobile & Montgomery.	180	10	61,847	3,200		13.77	19.05	1.370	6.71	2.80	0.48	0.79	6.33	17.20		1.90	
Marquette, Houghton & Ontonagon.	68	11	14,725	1,338	41.56	25.21	23.13		2.49	13.75	0.44		8.41	22.09		4.50	
Missouri, Kansas & Texas.	795	81	318,901	3,797	39.02	17.89	16.29	1.070	3.66	5.21	0.41	0.56	4.95	16.10		2.00	
N. Y. Penn. & Ohio, 1st and 2d divs.	628	83	260,871	3,215	35.58	18.13	18.29		1.67	7.44	0.46	1.14	5.08	15.79	2.36	2.83	
Third and Fourth Divs.	197	49	180,025	3,675	30.70	35.93	18.70		1.63	8.07	0.34	0.91	5.06	15.94	2.43	2.83	
Mahoning Div.	98	47	141,727	3,016	42.49	21.8	19.10		3.35	5.55	0.38	0.78	5.07	15.11	2.27	2.83	
North. Cent., Elmira & Can. Div.	147	45	98,820	2,106	29.90	16.13			4.10	6.17	0.51		5.73	16.51	1.89	2.40	
Ohio & Mississippi.	622		3,377		94.98	11.3			4.59	5.31	0.54		6.00	17.01	1.30	2.20	
Pennsylvania, New York Div.	131	18	39,065	3,394	31.09	12.96	14.88		3.10	5.10	0.34		5.06	16.10		2.00	
Amboy Div.	180	46	98,426	2,140	49.17	16.11			3.7	6.00	0.50		10.80	32.00	3.60	3.60	
Belvidere Div.	103	35	59,976	1,714	33.95	14.16			4	9.00	0.80		14.10	32.30	3.60	3.60	
Philadelphia Div.	172	141	410,342	2,910	29.04	14.20			7.70	5.60	0.69		13.90	14.00	2.85	2.85	
Richfield Div.	103	49	160,972	2,975	30.70	16.85			3.53	8.07	0.34		5.98	16.10	2.88	2.88	
Pittsburgh Div.	220	177	6,734	2,908	34.15	16.26			3.09	5.97	0.50		12.70	14.00	2.98	2.98	
Tyrone Div.	119	20	34,141	1,177	26.78	22.23			12.80	3.30	0.50		16.80	14.00	2.88	2.88	
West Penn. Div.	60	69	61,177	2,098	30.98	31.85			13.80	3.90	0.50		17.00	14.00	2.88	2.88	
Lawton Div.	68	9	9,406		25.77	16.20			2.8	5.50	0.40		6.70	14.00	3.02	3.02	
Bedford Div.	97	10	11,156	1,269	26.69	9.29	10.10		3.22	3.80	0.40		6.23	14.00	1.40	1.40	
Frederick Div.	149	8	19,840	2,455	36.49	20.75			2.80	7.70	0.50		11.00	23.4	4.57	4.57	
Pittsburgh, Va. & Charleston Div.	30	13	16,920	1,302	38.64	14.37			5.30	7.30	0.50		9.55	14.00	2.09	2.09	
Pitts., Ft. Wayne & Chi., East Div.	871	135	495,439	3,043	35.98	13.84	16.40	0.853	2.71	3.69	0.88	1.51	5.98	14.27	1.47	1.47	
Western Div.	939	111	434,695	3,141	36.81	35.55	24.80	0.791	5.96	3.98	0.52	2.36	5.83	17.08	1.32	1.32	
Pitts., Cin. & St. Louis, Little Miami Div.	197	37	100,390	2,711	41.43	13.77	16.83	0.818	4.16	5.48	0.42	2.23	5.51	17.80	2.97	1.50	
P. C. & St. L. Div.	224	100	293,038	2,633	28.93	15.96	19.89	0.820	3.22	3.64	0.40	2.87	5.99	18.92	0.96	2.00	
Quebec, Montreal, Ottawa & Occidental, Western Div.	138	11	40,379	3,070	71.30	32.00			1.50	6.88	0.32		3.50	12.90	4.00	4.00	
St. Louis & Southeastern.	908		51,780		42.40	15.99			3.04	2.79	0.74		4.70	10.85	1.10	1.10	
Savannah, Florida & Western.	343	29	89,098	3,054		41.26			4.30	8.90	0.30		10.10	14.60		2.60	
St. Louis & Western.	406	10	10,000	3,043	94.33	20.13			3.63	4.07	0.30		6.60	12.90		1.70	
Wabash, St. L. P. & Ohio & Ind. Div.	250	112	355,729	3,177	37.80	10.46	24.07	0.710	3.24	6.28	0.49		6.70	16.71	1.72	1.72	
Illinois Division.	441	86	230,736	3,34	80.03	13.0	19.75	1.000	3.95	5.4	0.32		6.57	15.88	1.50	1.50	
West Jersey	138	16	36,145	2,008	42.81	20.08			2.30	8.40	0.50		11.30	3.60	8.00	8.00	